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FINAL

ENVIRONMENTAL IMPACT STATEMENT

USDA-SCS-ES-WS-(ADM)-74-17(F)

KICKAPOO CREEK WATERSHED (LIPAN) PROJECT

ERATH, HOOD, PALO PINTO, and PARKER COUNTIES, TEXAS



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Page

SUMMARY
SPONSORING LO 1
PROJECT OBJEC 1
PLANNED PROJE 2
Conservatio 2
Structural 5
Operation a 13
Project Cos 14
ENVIRONMENTAL 15
Physical Da 15
Economic Da 18
Fish and Wi 20
Recreationa 20
Archeologic 21
Soil, Plant 21
Projects of 26
WATER AND RELATED LAND RESOURCE PROBLEMS 26
Land and Water Management 26
Floodwater Damage 27
Erosion Damage 28
Sediment Damage 28
Indirect Damages 29
Irrigation Problems 29
Municipal and Industrial Problems 29
Water Quality Problems 30
Economic and Social Problems 30
ENVIRONMENTAL IMPACT 30
Conservation Land Treatment and Structural Measures 30
Economic and Social 36
FAVORABLE ENVIRONMENTAL EFFECTS 39
ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED 40
ALTERNATIVES 40
RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY 43
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES . . . 45
CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS 46
General 46
Discussion and Disposition of Each Comment on Draft Environmental Impact Statement 47

LIST OF APPENDIXES

Appendix A - Comparison of Benefits and Costs for Structural Measures from the Work Plan
Appendix B - Project Map
Appendix C - Letters of Comment Received on the Draft Environmental Impact Statement

USDA-SCS-EIS-WS-(ADM)-74-17(F)

Kickapoo Creek Watershed (Lipan)
Erath, Hood, Palo Pinto, and Parker Counties, Texas

FINAL ENVIRONMENTAL IMPACT STATEMENT

Edward E. Thomas, State Conservationist
Soil Conservation Service

Sponsoring Local Organizations:

Hood-Parker Soil and Water Conservation District
P. O. Box 298, Weatherford, Texas 76086

Bosque Soil and Water Conservation District
P. O. Box 587, Meridian, Texas 76665

Palo Pinto Soil and Water Conservation District
P. O. Box 576, Mineral Wells, Texas 76067

Erath County Commissioners Court
County Courthouse, Stephenville, Texas 76401

Hood County Commissioners Court
County Courthouse, Granbury, Texas 76048

Parker County Commissioners Court
County Courthouse, Weatherford, Texas 76086

December 1974

Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Temple, Texas 76501

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USDA FINAL ENVIRONMENTAL IMPACT STATEMENT

Kickapoo Creek Watershed (Lipan) Project
Erath, Hood, Palo Pinto, and Parker Counties
Texas

Prepared in Accordance with Sec. 102 (2)(C) of P.L. 91-190

SUMMARY

I. Final

II. Soil Conservation Service

III. Administrative

IV. Description of Action:
A plan for watershed protection and flood prevention for the 81.50 square miles (52,160 acres) drainage area of the Kickapoo Creek watershed in Hood, Erath, Palo Pinto, and Parker Counties, Texas, will be carried out by the sponsoring local organizations with the assistance from the Soil Conservation Service, USDA, under the authority of Public Law 566, 83rd Congress, 68 Stat. 666, as amended. The plan proposes that land treatment be accomplished on about 12,260 acres and six single-purpose floodwater retarding structures be constructed during an eight-year installation period.

V. Summary of Environmental Impact and Adverse Environmental Effects:

1. Average annual flooding will be reduced from 1,203 acres to 423 acres, a reduction of 65 percent, which will allow approximately 50 owners and operators to carry on more efficient and profitable farm and ranch operations.
2. The interruption and delay of travel, rerouting of school busses and mail routes, disruption of farm operations, and associated business losses due to flooding in the watershed will be eliminated or greately reduced.
3. Erosion will be reduced on uplands by about 11 percent.
4. Sediment and scour will be reduced on flood plain lands 66 percent and 68 percent, respectively.
5. Sediment pollution in the Brazos River and Lake Granbury will be decreased.
6. Land treatment will prolong the usefulness of the present source and help maintain the quality of the water supply for the City of Lipan by reduction of sediment yielded to Bailey Lake.
7. Fish and wildlife habitat will be enhanced by providing:
   a. An additional 148 acres of fish habitat in the floodwater retarding structures sediment pools,
   b. Additional sources of drinking water,
   c. Nesting and resting areas for waterfowl,
   d. More and better food plants from land treatment for upland game, and

e. Flood protection for ground-nesting birds and burrowing animals in the flood plain.

8. The impoundments in the floodwater retarding structures' sediment pools will provide a potential for more sport fishing in the watershed.
9. A dependable water supply for livestock can be provided from the floodwater retarding structures' sediment pools.
10. Safety hazards at low water crossings will be reduced.
11. Economic activity in the local area will be increased by $160,390 annually.
12. A need for 21 new full-time jobs as a result of increased production, and 39 man-years of employment for installation of structural measures during the installation period will be created.
13. Dust and sediment pollution will increase slightly during construction of structural works of improvement.
14. Inundated areas in the sediment pools (148 acres) will be lost as upland wildlife habitat.
15. The construction of dams and emergency spillways will alter existing wildlife habitat on 125 acres.
16. Food supply for quail, dove, song birds, squirrel, deer, and furbearing animals will be reduced from the destruction of present habitat on the areas required for dams, emergency spillways, and sediment pools.
17. An increase in the density of grass cover in the project area will decrease the food supply for dove and bobwhite quail.
18. The clearing of 770 acres of brushy and woody vegetation to establish hay and coastal bermudagrass plantings on the bottomland will decrease wildlife habitat for squirrel, deer, furbearers, and some non-game birds.

VI. List of Alternatives Considered:

1. Land treatment only
2. Changing the present use of flood plain land to uses that are less susceptible to damage by flooding
3. Foregoing the implementation of a project

VII. Agencies From Which Comments Have Been Received:

U.S. Department of the Army; U.S. Department of the Interior; U.S. Department of Health, Education and Welfare; U.S. Department of Transportation; Environmental Protection Agency; Advisory Council on Historic Preservation; Division of Planning Coordination (State agency designated by Governor and State Clearinghouse); and North Central Texas Council of Governments (Regional Clearinghouse).

VIII. Draft Environmental Impact Statement transmitted to CEQ on January 31, 1974.

USDA SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT
for
Kickapoo Creek Watershed (Lipan)

Erath, Hood, Palo Pinto, and Parker Counties, Texas

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83rd Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Hood-Parker Soil and Water Conservation District
Bosque Soil and Water Conservation District
Palo Pinto Soil and Water Conservation District
Erath County Commissioners Court
Hood County Commissioners Court
Parker County Commissioners Court

PROJECT OBJECTIVES AND PURPOSES

An initial study was made by representatives of the Soil Conservation Service and sponsoring local organizations to determine watershed problems and possible solutions. After determining the location and extent of the problems and discussing potential solutions, project objectives were formulated. Watershed protection and flood prevention were the primary objectives expressed by the sponsors. The City of Lipan also wished to consider the feasibility of obtaining a municipal water supply from a multiple-purpose structure.

In addition to expressing the desire for establishment of a complete program for soil and water conservation on the watershed, the following specific objectives were agreed to:

1. Establish land treatment measures which contribute directly to watershed protection and flood prevention with a goal of at least 70 percent of the watershed adequately treated by the end of the project installation period.

2. Attain a reduction of 65 to 70 percent in average annual flood damage to agricultural flood plain lands, with a minimum of about 60 percent reduction in any one agricultural reach.

3. Develop municipal and industrial water storage in a multiple-purpose structure for the City of Lipan.

The sponsors considered the impacts, both favorable and adverse, in developing the plan for meeting the project objectives. The objectives selected

were those that would contribute to the conservation, development, and productive use of the watershed's soil, water, and related resources so that watershed residents can enjoy:

QUALITY IN THE NATURAL RESOURCE BASE FOR SUSTAINED USE

QUALITY IN THE ENVIRONMENT TO PROVIDE ATTRACTIVE, CONVENIENT, AND SATISFYING PLACES TO LIVE, WORK, AND PLAY

QUALITY IN THE STANDARD OF LIVING BASED ON COMMUNITY IMPROVEMENT AND ADEQUATE INCOME

The sponsors selected measures which will achieve two of the specific objectives and also included measures to minimize adverse impacts wherever practicable. The City of Lipan could not fulfill the financial responsibilities necessary to develop municipal water supply storage and the necessary appurtenant facilities.

PLANNED PROJECT 1/

The project is an integrated project for environmental protection which includes soil, water, and related resource conservation measures, both vegetative and structural, needed to control erosion, maintain or improve soil fertility, reduce flooding, and stimulate the local economy.

Conservation Land Treatment

Conservation land treatment consists of individual measures and practices or a combination of measures and practices that are planned, installed, and maintained on privately owned land by individuals or groups of landowners and operators or by local organizations. Land treatment measures planned for the watershed are those that will contribute directly to the preservation and enhancement of the environment in the watershed. Emphasis will be given to those measures which will reduce soil and water losses, assure proper functioning of the structural measures, reduce flooding, and preserve and improve the fish and wildlife resources of the watershed.

In addition to effectively maintaining the land treatment already established, it is planned to establish or complete the installation of the needed land treatment measures during an eight-year installation period on additional acreage as indicated in the following schedule.

1/ All information and data, except as otherwise noted by reference to source, were collected during watershed planning investigations by the Soil Conservation Service, U.S. Department of Agriculture.

Land Use	Fiscal Year				
	1st	2nd	3rd	4th	5th
	(acres)	(acres)	(acres)	(acres)	(acres)
Cropland	340	350	350	350	350
Pastureland	570	570	580	580	580
Rangeland	610	610	610	610	610
Total	1,520	1,530	1,540	1,540	1,540

Land Use	Fiscal Year - continued			Total
	6th	7th	8th	
	(acres)	(acres)	(acres)	(acres)
Cropland	350	350	340	2,780
Pastureland	580	570	570	4,600
Rangeland	610	610	610	4,880
Total	1,540	1,530	1,520	12,260

This schedule may be changed from year to year to conform with accomplishments and any mutually desirable changes.

With the installation of the planned land treatment, 70 percent of the watershed will be adequately treated. Adequately treated land is land used within its capability on which the conservation measures and practices that are essential to its protection and planned improvement have been applied.

Conservation land treatment applied and to be applied in this watershed will be on privately owned lands. The land user will make the decision on the use of his land and the treatment measures which he will install on his lands.

Conservation measures to be applied on cropland include conservation cropping system, crop residue management, diversions, terraces, and grassed waterways or outlets in combinations necessary to provide adequate treatment. Conservation cropping systems primarily include strip cropping and crop rotation of small grain with and without legumes, grain sorghums, and forage sorghums.

Crop residue management is the use of crop residues to protect cultivated land during critical erosion periods. Stubble mulching is the managing of plant residues on a year-round basis in which harvesting, tilling, planting, and cultivating operations are performed in a manner to keep protective vegetation on the soil surface. A diversion is a channel with a supporting ridge on the lower side constructed across

the slope of a field and is designed and located to protect land from erosion-producing storm runoff from adjacent areas. A terrace is also a land treatment measure consisting of an earth embankment or ridge and channel constructed across the slope of the land to retard and increase infiltration of runoff and reduce erosion on the land on which it is constructed. A grassed waterway or outlet is a natural or constructed waterway or outlet shaped or graded and established in suitable vegetation as needed for the safe disposal of runoff from a field, diversion, or terrace.

Conservation measures which will be applied on pastureland include the planting or reseeding of adapted species of perennial or biennial forage plants and their management for long time production and use.

Rangeland which does not have plants in the desired quantity or quality will receive conservation treatment measures. These measures may consist or one or a combination of the following: brush management, range seeding, proper grazing use, deferred grazing, and the application of planned grazing systems.

Rangeland which has satisfactory forage production will be managed to maintain or improve the existing range condition.

Brush management involves the selective control of noxious woody species to reduce competition and allow the establishment of desired vegetation. Methods of control which will enhance wildlife habitat and preserve esthetic values will be encouraged. The recommended method of implementing brush management in areas having populations of wildlife will retain units and patterns of brush of good habitat value in favorable locations for use as browse and cover. Oak, elm, and pecan compose about 10 percent of the present composition on the bottomland. These species will be retained. Brush management on the upland will leave about 20 percent of the woody species for wildlife cover. Range seeding is the establishment of adapted plants by seeding on rangeland. Range seeding is applicable on rangeland which cannot be improved within a reasonable period of time by grazing management practices due to the absence of a satisfactory seed source.

Proper grazing use, deferred grazing, and planned grazing systems involve the grazing of forage plants at periods of time and at intensities which are compatible with the physiological needs of the plant. Application of these practices assure the continued growth and survival of desired plant species.

Range seeding of areas on and adjacent to the sediment pools will be encouraged to retard erosion and prevent sedimentation. The construction of additional ponds will provide better grazing distribution and reduce vegetative destruction around existing water facilities.

Land treatment measures that are of value and benefit to wildlife will be installed and maintained. Small grain and legumes will be included in the conservation cropping systems to provide winter grazing for deer.

Wildlife upland habitat management will be practiced to enhance habitat for deer, turkey, bobwhite, and other species. Plantings of woody and seed-bearing vegetation on suitable areas such as idle or eroded lands, along fence rows, and around ponds will be encouraged. Landowners and operators will be encouraged to seek the advice of the Texas Parks and Wildlife Department and the Fish and Wildlife Service (formerly the Bureau of Sport Fisheries and Wildlife) on the stocking and managing of fish in farm ponds. These measures can help contribute to supplemental farm and ranch income from the sale of hunting and fishing leases.

Landowners and operators will continue to install and maintain measures needed in the watershed following the project installation period.

To facilitate the installation of land treatment during the eight-year installation period, soil surveys will be accomplished on 12,160 acres of the watershed that are not surveyed.

A soil survey is the classification, mapping, correlation, and interpretation of various types of soils in an area. Soils are classified considering their physical, chemical, and mineralogical characteristics. The classified soils are located and outlined on a map or aerial photograph of the area being surveyed, and correlated to determine the relationship of the various soils in the area to one another and to similar or identical soils identified in other areas. Soil survey interpretations indicate the limitations and suitability of a soil for selected uses.

Financial assistance is available from several sources to assist land users in the application of land treatment measures. Cost-share assistance is available through the Rural Environmental Conservation Program administered by the Agricultural Stabilization and Conservation Service and the Great Plains Conservation Program administered by the Soil Conservation Service. Loans are also available to land users through the Soil and Water Conservation Loan Program administered by the Farmers Home Administration and through local commercial lending institutions.

Structural Measures

A system of six single purpose floodwater retarding structures will be constructed in the Kickapoo Creek watershed. The locations of the floodwater retarding structures to be installed are shown on the project map (Appendix B). The six planned floodwater retarding structures will detain an average of 4.00 inches of runoff from 28.94 square miles of drainage area. These structures will control runoff from approximately 36 percent of the total watershed. The total storage capacity of the

floodwater retarding structures is 7,692 acre-feet, of which 1,518 acre-feet are for sediment storage and 6,174 acre-feet are for floodwater retarding storage.

Figure 1 shows a section of a typical floodwater retarding structure.

Pertinent physical parameters of each floodwater retarding structure are as follows:

Parameter	Structure Number					
	1	2	3	4	5	6
Height of Dam (ft.)	36	44	40	41	31	28
Length of Dam (ft.)	3,240	3,520	2,340	2,540	1,950	1,275
Sediment Pool (lowest ungated outlet - acres)	29	22	28	23	28	18
Floodwater Retarding Pool and Sediment Reserve Pool (acres)	106	225	70	97	67	71
Area in Dam and Emergency Spillway (acres)	17	24	14	29	24	17
Average Depth of Sediment Pool (ft.)	7	9	7	9	4	4

All structures are designed with sufficient sediment storage capacities to provide a 100-year project life. All planned structures will store both submerged and aerated sediment. Principal spillway crests of all structures will be set at the elevation of the 100-year sediment pool. The principal spillways for structures Nos. 1, 2, 3, and 4 will be ported, as required by Texas Water Rights statutes, at the elevations which will limit impoundments to 200 acre-feet including borrow. There will be 977 acre-feet of sediment storage capacity provided below the lowest ungated principal spillway openings of the floodwater retarding structures.

Preliminary and present indications are that principal spillways will be on compressible foundations and will have monolithic rectangular reinforced concrete inlets and prestressed concrete-lined, steel cylinder pipe outlet barrels. Rock-lined plunge pools for all floodwater retarding structures are included in the preliminary details. Structural details will be treated in the final design phase.

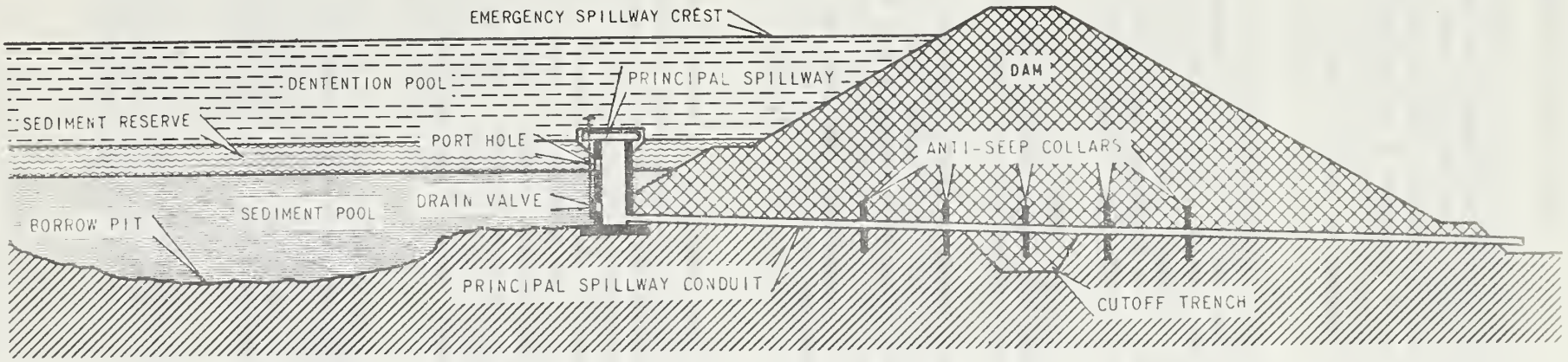


Figure 1

SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

U. S. D A., SOIL CONSERVATION SERVICE
USDA-SCS-FORT WORTH, TEX. 1971

6-71 4-L-10,071-C

The maximum capacity of the principal spillway at structure No. 3 is 43 cubic feet per second per square mile of drainage area (csm). This is higher than that of the other structures, which range from 15 csm up to 23 csm. The higher capacity at structure No. 3 was selected to prevent inundation of a cemetery at an elevation of 2.5 feet above the emergency spillway crest. The stream channel capacity below structure No. 3 is sufficient to convey the principal spillway discharge within channel banks.

All structures will have provisions to release impounded water in order to perform mainteance, and if it becomes necessary, to avoid encroachment upon prior water rights. These provisions for floodwater retarding structure No. 2 can be used, if needed, for release of water to Bailey Lake. If necessary, the sponsors will obtain water rights permits from the Texas Water Rights Commission as required under state law.

The dams will be earth fill with vegetative cover. Ample volumes of alluvial sandy clay, clayey sand, and silty clay, suitable for construction of the dams, are available within short haul distances.

Foundations are characterized by deep alluvial sandy clay, silty clay, silty sand, and minor amounts of silty gravel. Red shale of the Strawn Group underlies the alluvium and crops out on the major portions of abutments for structures Nos. 1, 4, 5, and 6. For structures Nos. 2 and 3, sand, clay, and soft sandstone of the Twin Mountains Formation underlie the alluvium and occur on abutments. Foundation drainage measures will be installed, if needed, to insure foundation and embankment stability.

All emergency spillways at finished grade will be in common earth materials. However, some rock excavation is anticipated on structure No. 5. Emergency spillways for structures Nos. 2 and 3 will be excavated in materials having a high potential for erosion in both the control and exit channel sections. Emergency spillways for structures Nos. 4, 5, and 6 have a medium potential for erosion in the control and exit channel sections. Since all the emergency spillways are potentially susceptible to at least moderate erosion, additional floodwater detention capacity has been added to all floodwater retarding structures to protect the emergency spillways. These volumes of storage capacities exceed minimum requirements.

Vegetation effective in controlling erosion will be established in the emergency spillway areas and on embankment slopes. In addition, a combination of multiple use plants, including woody species, adapted to prevailing conditions will be planted on all other disturbed areas for erosion control and wildlife food and cover. This includes areas above and below the dams.

The construction of the six floodwater retarding structures during an eight-year project installation period is expected to progress as shown in the following schedule.

	Fiscal Year							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Floodwater Retarding Structure No.	-	2	1	3	4	5	6	-

This schedule is subject to change from year to year to conform with appropriations, accomplishments, and any mutually desirable changes.

Installation of floodwater retarding structures will require change in location or modification of known existing improvements as follows:

Site No. 1 - Private roads, fences, and four livestock watering ponds

Site No. 2 - Private roads, fences, livestock watering pond, two barns, unoccupied house, two power lines, and a telephone line

Site No. 3 - Private roads, fences, waterwell, abandoned house, and a power line

Site No. 4 - Fences, six livestock watering ponds, power line, telephone line, and a county road

Site No. 5 - Private roads, fences, four livestock watering ponds, barn, and livestock pens

Site No. 6 - Private road and a livestock watering pond

During construction, contractors will be required to adhere to strict standards set forth in a construction contract to protect the environment by minimizing soil erosion and water and air pollution. These standards will be in compliance with U.S. Department of Agriculture, Soil Conservation Service Engineering Memorandum 66, "Guidelines for Minimizing Soil Erosion and Water and Air Pollution During Construction". Excavation and construction operations will be scheduled and controlled to prevent exposure of extraneous amounts of unprotected soil to erosion and the resulting translocation of sediments. Measures to control erosion will be uniquely specified for each work site and will include, as applicable, use of temporary vegetation or mulches, diversions, mechanical retardation of runoff, and traps. Harmful dust and other pollutants inherent to the construction process will be held to minimum practical limits. Haul roads and excavation areas, and other work sites will be sprinkled with water as needed to keep dust within tolerable limits. Contract specifications will require that fuel, lubricants, and chemicals be adequately labeled and stored safely in protected areas, and disposal at each work site will be by approved methods and procedures. Clearing and disposal of brush and vegetation will be carried out in accordance with

applicable laws, ordinances, and regulations in respect to burning. The contract will set forth specific stipulations to prevent uncontrolled grass or brush fires. Disposal of brush and vegetation will be by burying, hauling to approved off-site locations, or controlled burning, as applicable.

Stringent requirements for safety and health in conformance with the Construction Safety Act will be included in the construction contract.

Necessary sanitary facilities, including garbage disposal facilities, will be located to prohibit such facilities from being a pollution hazard to live streams, wells, springs, or downstream impoundments in conformance with Federal, State, and local water pollution control regulations. Special provisions in the construction contract will incorporate by reference, and thereby make the contract provisions conform to "Safety and Health Regulations for Construction, Part I and Part II", U.S. Department of the Interior, Bureau of Reclamation. Soil Conservation Service guidelines that provide for the incorporating of the Bureau of Reclamation regulations into construction contracts are in the "Soil Conservation Service Administrative Services Handbook, Chapter 6". Conformance to all environmental control requirements will be monitored constantly by a construction inspector who will be on-site during all periods of construction operation.

The implementation of the aforementioned standards and measures for preservation of water quality in Bailey Lake during the construction of floodwater retarding structure No. 2 is of paramount importance due to the relative locations of the structure site and the lake. Necessary measures and precautions will be utilized during installation of the floodwater retarding structure to insure runoff originating on the construction site does not degrade the quality of water in Bailey Lake to the degree that the water is not suitable for municipal use in Lipan.

Efforts will be made to avoid creating conditions which will increase populations of vectors which affect public health conditions. Prevention and control measures will be implemented, if needed, in cooperation with appropriate Federal, State, and local health agencies to suppress proliferation of vectors such as aquatic insects, terrestrial arthropods, and rodents, etc. that could occur with installation of the structures.

The six floodwater retarding structures are scheduled to be constructed during six years of the eight-year installation period. It is not anticipated that construction work on more than two floodwater retarding structures will be underway at the same time. This will minimize cumulative environmental effects resulting from construction activities.

All applicable state laws will be complied with in the design and construction of the structural measures as well as those pertaining to the storage, maintenance of quality, and use of water.

Kickapoo Creek Watershed, Texas

The watershed work plan has been coordinated with the Texas State Historical Commission and the National Park Service, USDI. An archeology survey of the floodwater retarding sites was conducted by the Department of Anthropology, Archeology Research Program, Southern Methodist University, under the direction of Mr. S. Alan Skinner as principal investigator. Four archeological sites were observed within the areas required for the construction and functioning of the floodwater retarding structures Nos. 2, 3, and 4. Archeological sites were not located on the areas needed for floodwater retarding structures Nos. 1, 5, and 6. Due to the eroded condition of the sites observed, no additional archeological survey work is recommended by Mr. Skinner. However, if evidence of significant archeological features is observed before or during construction, the Secretary of the Interior will be notified so he may have investigations carried out to evaluate and salvage, if warranted, the resources. This will be done in compliance with Public Law 86-523.

The minimum land rights required will be those necessary to construct, operate, maintain, and inspect the works of improvement; to provide for flowage of water in, upon, or through the structures; and provide for the permanent storage and temporary detention, either, or both of any sediment or water.

Under present conditions, there will be no apparent displacements or relocations of persons, businesses, or farm operations as a result of installation of structural measures. If relocations or displacements become necessary, they will be carried out under the provisions of Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

Installation of the structural measures will require 909 acres of land which includes 80 acres of cropland, 159 acres of open pastureland, 161 acres of open rangeland, and 509 acres of wooded rangeland. The construction of dams and emergency spillways will require about 125 acres of which 4 acres are cropland, 35 acres are open pastureland, 42 acres are open rangeland, and 44 acres are wooded rangeland. The sediment pools at the lowest ungated outlet will inundate 148 acres of which 4 acres are cropland, 13 acres are open pastureland, 38 acres are open rangeland, and 93 acres are wooded rangeland. These pools will inundate about 4.8 miles of normally dry stream channels. The retarding and sediment reserve pools will require 636 acres of land, of which 72 acres are cropland, 111 acres are open pastureland, 81 acres are open rangeland, 372 acres are wooded rangeland, for temporary impoundment of floodwater. Preliminary investigations indicate all needed materials for the dams can probably be obtained from required excavation in the emergency spillways and from designated borrow areas within sediment pools.

Approximately 137 acres will be cleared of all existing woody vegetation for the construction of dams, emergency spillways, and sediment pools below the lowest ungated outlet. Native grasses will be disturbed as little as possible. This vegetation consists of various species and

Kickapoo Creek Watershed, Texas

approximate acreages as follows:

Forty-four acres have scattered post oak (Quercus stellata), mesquite (Prosopis juliflora), elm (Ulmus spp.), skunkbush sumac (Rhus aromatica), greenbrier (Smilax spp.), lotebush (Condalia obtusifolia), tasajillo (Opuntia leptocaulis), and willow (Salix nigra) with and average height of less than five feet.

Thirty-eight acres have an overstory of cedar elm (Ulums crassifolia), post oak, bumelia (Bumelia lanuginosa), and live oak (Quercus virginiana), with a canopy of about 70 percent. Basal area of woody species ranges between 60 and 120 square feet per acre. The average diameter is 6 inches and ranges between 3 and 16 inches. Understory species include greenbrier, virginia creeper (Parthenocissus quinquefolia), grape (Vitus spp.), skunkbush, bumelia, elbowbush (Forestieria pubescens), redberry juniper (Juniperus pinchoti), elm, post oak, and hackberry (Celtis laevigata).

Twenty-six acres have an overstory of post oak and cedar elm with a canopy of 35 percent. Basal area of the woody species is about 20 square feet per acre. The average diameter is 6 inches ranging from 3 to 11 inches. Understory species include scattered mesquite, prickly pear (Opuntia spp.), bumelia, greenbrier, and hawthorn (Crataegus spp.).

Fifteen acres of the woody vegetation have an overstory of bumelia, post oak, elm, and scattered Texas oak (Quercus shumardii var. Texana), live oak, and cottonwood (Populus deltoides), with a canopy of about 60 percent. Basal area of the woody species is between 60 and 70 square feet per acre. The average diameter of overstory species is about 10 inches and ranges from 5 to 17 inches. Understory species include greenbrier, bumelia, dogwood (Cornus drummondii), indigobush (Amorpha fruticosa), skunkbush sumac, blackhaw (Viburnum rufidulum), grape, mesquite, and hawthorn.

Twelve acres have an overstory of cedar elm, slippery elm (Ulmus rubra), cottonwood, pecan (Carya illinoensis), texas oak, and live oak, with a canopy of about 60 percent. Basal area of the woody species is about 60 square feet per acre. Average diameter is about 13 inches ranging from 6 to 30 inches. One cottonwood, which is atypical of the rest, measures 49 inches in diameter. Understory vegetation includes hackberry, blackhaw, dogwood, wild plum (Prunus spp.), elbowbush, carolina buckthorn (Thamnus caroliniana), bumelia, greenbrier, grape, poison-ivy (Rhus toxicodendron), redberry juniper, and virginia creeper.

There are two acres of fence rows which have pecan and western soapberry (Sapindus drummondii) with an average diameter of about 10 inches.

Operation and Maintenance

Planned land treatment measures will be maintained by landowners and operators of farms and ranches on which measures are applied under agreement with the Hood-Parker, Bosque, and Palo Pinto Soil and Water Conservation Districts. Representatives of the districts will make periodic inspections of land treatment to determine maintenance needs and encourage landowners and operators to perform maintenance.

The environment will continue to be protected from soil erosion and water pollution during and following completion of construction. Project sponsors will operate and maintain the structural measures in accordance with a specific operation and maintenance agreement for each floodwater retarding structure. The operations and maintenance agreement will be executed prior to signing a project agreement for the construction of any of the six floodwater retarding structures. A specific operation and maintenance plan will be prepared for each structural measure. The agreement will set forth the inspections to be made and the maintenance to be performed to prevent soil erosion and water pollution.

The Commissioners Court of Erath County will be responsible for operation and maintenance of floodwater retarding structures Nos. 1 and 2. The Commissioners Court of Hood County will be responsible for the operation and maintenance of floodwater retarding structures Nos. 3, 4, and 5. The Commissioners Court of Parker County will be responsible for the operation and maintenance of floodwater retarding structure No. 6. The estimated annual cost of operation and maintenance is $2,480. These funds will come from the general fund of the county in which the structure or structures are located. The general fund of each county is supported by existing taxes and is available and adequate for this purpose.

In addition to the above responsibilities for operation and maintenance, the Erath County Commissioners Court will be specifically responsible for the operation of the drain valve at Floodwater Retarding Structure No. 2. The Court will operate the drain valve,as needed, to release available water from the sediment pool of the floodwater retarding structure into Bailey Lake during critical periods which deplete the storage of the lake to a level where water cannot be withdrawn for minimum needs of the City of Lipan.

Floodwater retarding structures will be inspected at least annually and after each heavy rain by representatives of the Erath, Hood, and Parker County Commissioners Courts and the Bosque, Hood-Parker, and Palo Pinto Soil and Water Conservation Districts. A Soil Conservation Service representative will participate in these inspections for a period of at least three years following construction of each structure. The Soil Conservation Service will participate in inspections as often as it elects to do so after the third year. Inspections after the third year will be made annually by the sponsors. Items of inspection will include, but are not limited to, conditions of principal spillways and their appurtenances, emergency spillways, and earth fills. A written report will be made of each inspection. A copy of each report

will be provided by the responsible organization or organizations to each other organization having operation and maintenance responsibilities and to the designated Service representative within ten days of the date on which the inspection was made.

The appropriate counties will be responsible for and perform promptly, or have performed, without cost to the Service, all maintenance of the structural measures as determined to be needed by either the sponsors or the Service immediately following completion of the structures by the contractor. The counties will be responsible for maintenance associated with structural measures after the vegetation is satisfactorily completed, as determined by the Service. However, the counties will assume their responsibilities not later than three years following completion of each structural measure.

The Soil Conservation Service, through the Soil and Water Conservation Districts, will participate in operation and maintenance only to the extent of furnishing technical assistance to aid in inspections and technical guidance and information necessary for the operation and maintenance program.

Provisions will be made for unrestricted access by representatives of sponsoring local organizations and the Soil Conservation Service to inspect all structural measures and their appurtenances at any time and for sponsoring local organizations to operate and maintain them. Easements insuring this unrestricted ingress and egress will be furnished by the sponsoring local organizations.

Sponsors will control the handling, storage, and application of herbicides and pesticides that may be necessary for operation and maintenance of structural works of improvement. Approved reagents and compounds will be used. Their application will be compatible with current laws regulating their use. In addition to sound and prudent judgment, ordinances and standards concerned with the disposal or storage of unused chemicals, empty containers, contaminated paraphernalis, etc., will be observed and applied.

The Erath, Hood, and Parker County Commissioners Courts will keep a record of all maintenance inspections made, maintenance performed, and cost of such maintenance and have it available for inspection by Soil Conservation Service personnel.

The necessary maintenance work will be accomplished by contracts, force accounts, or equipment owned by sponsoring local organizations.

Project Costs

The estimated costs for installation of the project are presented in the following tabulation:

Installation Cost Item	Estimated Cost (Dollars) 1/		
	Public Law 566	Other	Total
Land Treatment			
Installation	-	360,700	360,700
Technical Assistance	51,900	48,700	100,600
Subtotal	51,900	409,400	461,300
Structural Measures			
Construction	654,550	-	654,550
Engineering	39,790	-	39,790
Project Administration	108,350	2,900	111,250
Land Rights	-	106,530	106,530
Subtotal	802,690	109,430	912,120
Total Project	854,590	518,830	1,373,420

The estimated average annual cost of operation and maintenance of the six floodwater retarding structures is $2,480, of which $1,110 is for structures in Erath County, $1,110 is for structures in Hood County, and $260 is for the structure in Parker County.

ENVIRONMENTAL SETTING

Physical Data

The Kickapoo Creek watershed drainage area is 81.50 square miles (52,160 acres), has an average width of six miles, and is 17 miles long. Kickapoo Creek watershed is located in north-central Texas about 50 miles southwest of Fort Worth. Kickapoo Creek rises in the extreme northeastern corner of Erath County about 15 miles north of Stephenville. Following a northeastward course the main stream crosses the northwestern corner of Hood County, passing closely by the community of Lipan, and enters southwestern Parker County where it joins the Brazos River. The Brazos River and its tributaries are in the Texas Gulf Water Resource Region. The extreme southeastern corner of Palo Pinto County is also drained by Kickapoo Creek.

Major tributaries of Kickapoo Creek are Dry Branch, Crockery Creek, Rocky Creek, Onion Creek, and Cottonwood Creek.

Most of the stream channels are usually dry except during times of surface runoff. However, a few small seasonal springs discharge a minor amount of streamflow. The spring discharge is dependent upon at least near normal rainfall in the watershed and immediate area.

1/ Price Base: 1974

Kickapoo Creek Watershed, Texas

Kickapoo Creek, the main stem creek in the watershed, has a total length of about 34 miles of stream channel. Of this, about 30 miles have intermittent stream channel flow and 4 miles have ephemeral flow. The ephermeral flow occurs in two separate stream reaches which are located from the Brazos River upstream to where Cottonwood tributary joins Kickapoo Creek and between floodwater retarding structure No. 2 and Bailey Lake.

Spring discharge and streamflow cease during periods of drought. Stream channels in the watershed remain in their natural state except where they have been modified by the construction of bridges and low water crossings.

Bailey Lake is a small privately owned reservoir located on Kickapoo Creek about 1.5 miles southwest of Lipan. There are no existing or proposed water resource development projects of any other agencies within the watershed.

The watershed contains outcrops of Quaternary, Cretaceous, and Pennsylvanian sedimentary strata. 1/ Removal of Cretaceous rocks by geologic erosion has resulted in exposure of Pennsylvanian limestone, shale, sandstone, and conglomerate beds belonging to the Strawn Group. The exposure exists as an inlier occupying the inner 24 percent of the watershed along and adjacent to Kickapoo Creek. Kickapoo Falls, located on Kickapoo Creek about four miles northeast of Lipan, is formed by a very hard 10 to 12 feet thick limestone member of the Strawn Group. Cretaceous sand, clay, and soft conglomerate of the Twin Mountains Formation rest unconformably upon the Pennsylvanian beds and surround the inlier. The outcrop of the Twin Mountains Formation covers 57 percent of the watershed. Alternating beds of Cretaceous limestone, silt, and clay occupy the higher elevations in the southern and western 19 percent of the watershed and form a protective cap above the more easily eroded Twin Mountains Formation. The protective beds belong to the Glen Rose Formation.

The Quaternary Strata consist of sand, clay, and gravel terrace deposits near the Brazos River and the Recent Alluvium along the Kickapoo Creek and its major tributaries. The Recent Alluvium, derived mainly from materials of the Glen Rose Formation, consists mostly of clay and silt.

The topography is nearly level on the flood plain, rolling to gently rolling on the outcrops of the Strawn Group and the Twin Mountains Formation, and rolling to steeply sloping on the outcrop of the Glen Rose Formation. Elevations range from nearly 1,300 feet above mean sea level on the western divide to about 700 feet at the Kickapoo Creek-Brazos River confluence.

1/ Geologic Atlas of Texas, Dallas Sheet, Bureau of Economic Geology, The University of Texas at Austin, Texas.

Three major land resource areas occur within the watershed. Generally, the Central Rolling Red Prairies Land Resource Area occurs on the geologic Strawn outcrop, the Cross Timbers occurs on the Twin Mountains outcrop, and the Gran Prairie occurs on the Glen Rose outcrop. Quaternary strata occur within all three land resource areas.

Soils of the Central Rolling Red Prairies Land Resource Area are primarily clays, clay loams, fine sandy loams, loamy fine sands, and stony clay loams of the Thurber, Tobosa, Stamford, Truce, Bonti, Chaney, Hensley, Demona, and Blanket series.

The Cross Timbers Land Resource Area is composed of fine sandy loams and fine sands of the Windthorst, May, Dougherty, and Nimrod soil series.

The Grand Prairie Land Resource Area in the watershed is characterized by clay and clay loam soils of the Purves, Dugout, Krum, Tarrant, Denton, Lewisville, Frio and Bosque series.

The climax plant community of the Central Rolling Red Prairie and Cross Timbers Land Resource Areas is generally a post oak savannah. The primary decreasers include little bluestem (Andropogon scoparius), big bluestem (Andropogon gerardi), and indiangrass (Sorghastrum nutans). Grasses which increase with grazing are sideoats grama (Bouteloua curtipendula), texas wintergrass (Stipa leucotrica), and hooded windmillgrass (Chloris cucullata). Common invaders include silver bluestem (Andropogon saccharoides), threeawns (Aristida spp.), and gummy lovegrass (Eragrostis curtipedicellata). Post oak increases and may become dominant when the grass cover deteriorates. Mesquite is a common woody invader on the soils of these resource areas.

The Grand Prairie Land Resource Area varies from a true prairie to a post oak and live oak savannah in climax condition. Elm, pecan, hackberry, and other woody species are numerous in the climax communities but confined to watercourses. Primary decreasers include indiangrass, big bluestem, and little bluestem. Increaser species are sideoats grama, silver bluestem, texas wintergrass, dropseeds (Sporobolus spp.), hairy grama (Bouteloua hirsuta), and buffalograss (Buchloe dactyloides). Invading species include texas grama (Bouteloua rigidiseta), red grama (Bouteloua trifida), threeawns, and queensdelight (Stillingia sylvatica). Mesquite is a major invader on some range sites.

Much of the vegetation within the watershed bears little resemblance to its climax condition. Overuse by grazing animals has destroyed or altered plant species and composition to a marked degree on more than 90 percent of the rangeland. Dominant climax grass plants such as Indiangrass and little bluestem have been replaced by less productive species such as texas wintergrass, sideoats grama, buffalograss, and threeawns on a majority of rangelands. Perennial forbs of value as wildlife and livestock forage have been largely eliminated. Woody

species such as post oak and mesquite dominate about 13,000 acres of the watershed to a degree which adversely affects forage production. Hydrologic cover conditions range from poor to good with more than 80 percent in fair condition.

Land use within the watershed is shown in the following tabulation:

Land Use	Acres	Percent
Cropland	11,900	23
Pastureland and Hayland	6,760	13
Rangeland	32,170	62
Miscellaneous *	1,330	2
Total	52,160	100

* Includes roads, highways, urban areas, farmsteads, stream channels, etc.

The present land use within the flood plain area is approximately 1,036 acres of cropland which are devoted to production of oats, Sudan hay, and a small amount of cotton; and 1,865 acres of pastureland of which about 265 acres are improved pastureland; and 59 acres are roads and other miscellaneous uses.

The climate is warm and subhumid. Mean monthly temperatures range from 44 degrees Fahrenheit in January to 84 degrees in July. The normal growing season, extending from late March to early November, is about 230 days. The average annual rainfall is about 32 inches. 1/

Water for livestock and rural domestic use is obtained from ponds, spring fed streams, and shallow low producing wells. Lipan obtains its water supply from Bailey Lake which is fed by seasonal spring flows that issue from the base of the Twin Mountains Formation. During prolonged periods of drought, these are not reliable sources of water.

There are no known mineral resources of economic significance within the watershed.

Economic Data

The economy of the watershed is dependent largely on agriculture. The sale of livestock, poultry, and related products accounts for 90 percent of the on-farm income within the watershed. The remaining 10 percent is derived from the sale of crops including peanuts, grain sorghum, cotton, small grains, and hay.

1/ U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, Climatological Data, Texas, Annual Summary 1972, Volume 77, No. 13.

Major crops grown on the flood plain and average yields per acre are: oats, 35 bushels; hay crops, 2.5 tons; and improved pastureland, 4 animal unit months of grazing.

During recent years, the trend in both upland and flood plain has been toward increased livestock production. This has resulted in the shifting of cropland from cash crops to forage and hay crops and improved pastureland. Some unimproved and brushy pastureland has been established to improved grasses and hay crops.

There are approximately 200 farm and ranch units wholly or partially within the watershed. These units average about 250 acres in size and range from less than 50 to more than 1,000 acres. About 73 percent of the farms and ranches are smaller than 220 acres. There has been a gradual increase in size and a decrease in the number of farms. About 90 percent of the agricultural land is owner-operated.

The estimated current market price of land without improvements ranges from $125 to $400 per acre. The range in land prices depends on location, accessibility, and soil capability.

Based on 1969 Agricultural Census data for Erath, Hood, Palo Pinto, and Parker Counties, about 51 percent of the farms and ranches gross less than $2,500 annually from agricultural sales. Approximately 56 percent of the farm and ranch operators worked off-the-farm 100 days or more in 1969. The average value of land and buildings per farm and ranch is estimated at about $77,000.

It is estimated that less than five percent of the agricultural land in the flood plain area is in operating units using one and one-half man-years or more of hired labor.

The "Labor Force Estimates for Texas Counties, April 1974" shows a labor force of 36,720 for the four counties within which the watershed is located. Slightly over 3.7 percent, or 1,350 workers are unemployed. This is below both the state and national rate of unemployment. Approximately 48.8 percent, 17,910 workers are employed in the agricultural sector. The nonagricultural sector employs 17,460 workers; 4,390 workers in the manufacturing sector, and 13,070 in the nonmanufacturing sector.

The incorporated City of Lipan, with a population of 333, is located in the upper portion of the watershed. Nearby towns and their approximate distances from Lipan are: Granbury, 15 miles southeast; Mineral Wells, 25 miles northwest; Stephenville, 24 miles southwest; and Weatherford, 31 miles northeast. These towns provide the needed services and marketing facilities for the area. The large industrial and metropolitan city of Fort Worth is approximately 55 miles to the northeast.

Approximately 83 miles of state and county roads, of which about 33 miles are hard-surfaced, serve the watershed residents.

Kickapoo Creek Watershed, Texas

Erath County is within the boundaries of the Leon-Bosque Resource Conservation and Development Project area.

Fish and Wildlife Resources

The fish and wildlife habitat, species, and population in the watershed are described by the Fish and Wildlife Service as follows:

> "Fish habitat in the project area is limited to permanent pools in the intermittent creeks, farm ponds, and three small private reservoirs.
>
> The principal fish species in the watershed are largemouth bass, bluegill, redear and green sunfish, channel catfish, gizzard shad, carp, and river carpsucker. There is some fishing by landowners and their friends on private property.
>
> Important game species in the watershed are white-tailed deer, bobwhite, and mourning dove. Other wildlife species present include fox squirrel, cottontail, oppossum, raccoon, gray fox, red fox, bobcat, coyote, ring-tailed cat, and skunk. A few water fowl pass through the project area during spring and fall migration.
>
> The deer population is moderate in numbers in the southeast portion of the watershed and low elsewhere. Deer hunting is light to moderate, and most of it is on a lease basis. Squirrel numbers are modest along the water courses and low elsewhere. These animals receive moderate hunting. Quail are found in low to moderate numbers in the project area, and hunting for them is medium to heavy. Mourning doves are present in fair numbers in most of the watershed, and there is much interest in hunting them. Little duck hunting is done in the watershed because of low populations. There is some interest in sport hunting for raccoons, bobcats, foxes, and coyotes. Some raccoons are trapped for their fur."

The watershed is within the winter range of the American peregrine falcon and southern bald eagle and on the western edge of the migration route of the whooping crane. These species may occasionally traverse the watershed but are not permanent residents. The golden-cheeked warbler may possibly be a summer resident in the watershed.

Recreational Resources

There are opportunities for fishing and hunting in the watershed and surrounding area. Fish and wildlife species of significance in the watershed are described under Fish and Wildlife Resources.

Lake Granbury, in addition to providing opportunities for fishing, furnishes other water-based recreation such as boating, waterskiing, swimming, and picnicking.

Kickapoo Creek Watershed, Texas

Archeological and Historical Values

There are no historic sites listed or in the process of nomination to the National Register of Historic Places. There are no known archeological resources of significance within the watershed.

Soil, Plant, and Water Management Status

The Hood-Parker, Bosque, and Palo Pinto Soil and Water Conservation Districts were organized as sub-divisions of state government with responsibility in the field of soil and water conservation. The Districts are dedicated to the conservation of soil, water, plant, and related resources. They are governed by a locally elected board of directors. Technical assistance to the Districts is provided by the Soil Conservation Service through an existing memorandum of understanding with the United States Department of Agriculture. The Districts establish policies and set priorities for conservation of resources within the districts. Soil and water conservation districts constitute a significant level of citizen control in decision making. 1/

The District does not have regulatory authority and operates a cooperative voluntary program of assistance to land users within the district. In order to become a district cooperator a land user signs a cooperative agreement with the appropriate soil and water conservation district in which he agrees to use his land within its capabilities, treat his land in keeping with its needs, develop a conservation plan for his entire farm or ranch, start applying one or more conservation measures, maintain all applied measures, and properly use any materials or equipment furnished him by the district.

When a land user becomes a cooperator the district agrees to assist the land user in carrying out a conservation plan by furnishing to the land user any information, technical assistance, supervision, or other assistance it may have available.

Land users who elect to cooperate with the District in the application of a conservation program for land they own or control are provided technical assistance in the planning and application of conservation measures. Most land treatment decisions are based on a resource conservation plan developed by the land user in consultation with technical personnel assisting the District. Conservation plans are documents which contain material relative to the use and treatment of soil, water, plant, wildlife, and related resources of an entire individual land unit. Conservation plans contain soil, water, plant, and other needed inventories, data on critical conservation problems, and a record of decisions which land users have made to reach conservation objectives. The length of time required to fully implement a plan is contingent upon many factors, including available labor, capital, materials, and time.

1/ Irland, Lloyd D., and Ross J. Vincent. "Citizen Participation in Decision Making--A Challenge for Public Land Managers", Journal of Range Management, 27 (3) 182-185.

Kickapoo Creek Watershed, Texas

There are 126 farm and ranch units wholly or partially within the watershed under district agreement with the Hood-Parker, Bosque, and Palo Pinto Soil and Water Conservation Districts. Soil Conservation Service field offices at Granbury, Stephenville, Weatherford, and Mineral Wells are assisting the districts in preparing and applying soil and water conservation plans.

Conservation plans have been developed for all 126 farm and ranch units which are under agreement and cover 70 percent of the agricultural land in the watershed. There are no serious upland erosion problems resulting from improper use of land in the watershed. Soil surveys, which are essential for sound conservation plans, have been completed on about 80 percent of the watershed or nearly 40,000 acres and are needed on the remaining watershed area. Land treatment measures which have been applied to date at an estimated expenditure of $473,500 by land users amount to about 45 percent of the total treatment needed.

Over half of the flood plain lands are utilized far below their potential. Farm and ranch operators are not able to establish improved grasses, plant high producing feed crops, or fertilize to any significant extent on much of the flood plain because flooding may occur at any time and result in severe damage or reduce greatly the effectiveness of fertilizers and other monetary inputs associated with management practices.

In forested flood plain lands, the owners can be provided with a range of management alternatives for their lands. The Texas Forest Service, in cooperation with the U.S. Forest Service, is available to help land users develop forest management plans for these and other woodlands under existing and active cooperative Forest Management programs. Forest management possibilities include: tree planting and stand improvement measures for the enhancement of the water related capabilities of the forest; and other forest uses including wood products, wildlife habitat, recreational resources, esthetics, and climatic influences.

Land users have been provided technical assistance in the application of wildlife management practices. About 60 percent of District cooperators have incorporated specific wildlife management practices in conservation plans. Approximately 15 percent of watershed land users lease their lands for hunting or fishing. Prices for hunting leases vary depending on quality, location, and other factors but generally range from one to two dollars per acre. About 55 percent of watershed land users limit hunting and fishing to families and friends. About 30 percent of the farm ponds in the watershed are stocked and managed for fishing. Conservation practices which benefit wildlife have been applied on about 40 percent of lands which are under management with Soil and Water Conservation Districts.

Trends in flood plain and upland areas have resulted in the shifting of cropland from cash crops to pastureland and hayland. Presently 75 percent of the watershed is used as rangeland and pastureland.

Kickapoo Creek Watershed, Texas

Conservation plans are developed which accomplish the objectives of the land user and result in conservation of basic resources. A careful evaluation of alternatives often reveals conflict in the selection of planned land treatment measures. As an example, the conversion of rangeland to pastureland may increase the economic return from livestock and reduce its value to wildlife. The ultimate decision of land use and treatment rests with the land user so long as it is consistent with sound resource management.

Water samples were taken throughout the watershed. Locations where samples were taken are shown on Figure 2. The collection and analysis of the samples were done by Environmental Sciences of San Marcos, San Marcos, Texas, in conformance with criteria and procedures set forth in "Standard Methods for Examination of Water and Waste Water", 13th edition, American Public Health Association, American Water Works Association, and Water Pollution Control Association, Washington D.C. The results of the analysis are as shown in the following tabulations.

Sample	Temperature *°C	pH	Specific Conductance *µmhos	*D.O. *mg/l	*BOD5 *mg/l	*TDS *mg/l	Fecal Coliforms *No./100 ml.
A	21.5	7.53	195	6.45	5.02	170	8,500
B	22.5	7.69	475	6.20	2.31	323	4,500
C	23.0	7.86	440	4.28	3.59	307	3,300
D	22.0	7.80	162	3.72	4.86	142	65,000
E	22.0	7.60	170	7.09	2.98	155	8,500
F	22.0	7.19	105	4.24	4.86	102	12,200
G	22.5	7.39	62	5.28	3.68	69	6,400
H	22.0	7.76	155	6.65	3.70	118	44,000
I	23.0	7.71	160	7.08	3.58	112	7,000
J	22.5	7.72	155	7.05	3.52	109	8,200

*D.O. - Dissolved Oxygen
BOD_5 - Biological Oxygen Demand, 5 day
TDS - Total Dissolved Solids
°C - Degrees Centigrade
µmhos - Micromho (mho - reciprocal ohm)
mg/l - Milligrams per liter
No./100 ml. - Number per 100 milliliters

Sample	T-PO_4	N-NO_3	Na^+	Ca^{++}	Mg^{++}	K^+	$CO_3^=$	HCO_3^-	Cl^-	$SO_4^=$
	*mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
A	-----	----	9.6	21.0	4.8	7.1	0	67.8	10.3	16.0
B	0.068	0.24	23.0	58.0	17.1	5.4	0	192.5	22.6	39.0
C	0.084	0.26	36.0	26.0	21.0	5.4	0	144.6	34.4	38.0
D	0.182	0.50	3.8	25.0	4.0	5.2	0	83.6	6.1	13.0
E	-----	----	4.2	23.0	3.1	4.8	0	75.0	5.2	8.5
F	-----	----	1.7	16.0	2.2	5.0	0	41.2	3.3	6.2
G	-----	----	1.7	11.0	1.2	3.2	0	35.5	1.2	4.8
H	-----	----	6.8	21.0	3.1	4.8	0	66.4	6.5	9.5
I	-----	----	5.4	20.0	2.8	4.2	0	69.2	5.8	9.4
J	-----	----	5.0	20.0	2.8	4.2	0	70.9	5.3	8.6

*mg/l - Milligrams per liter

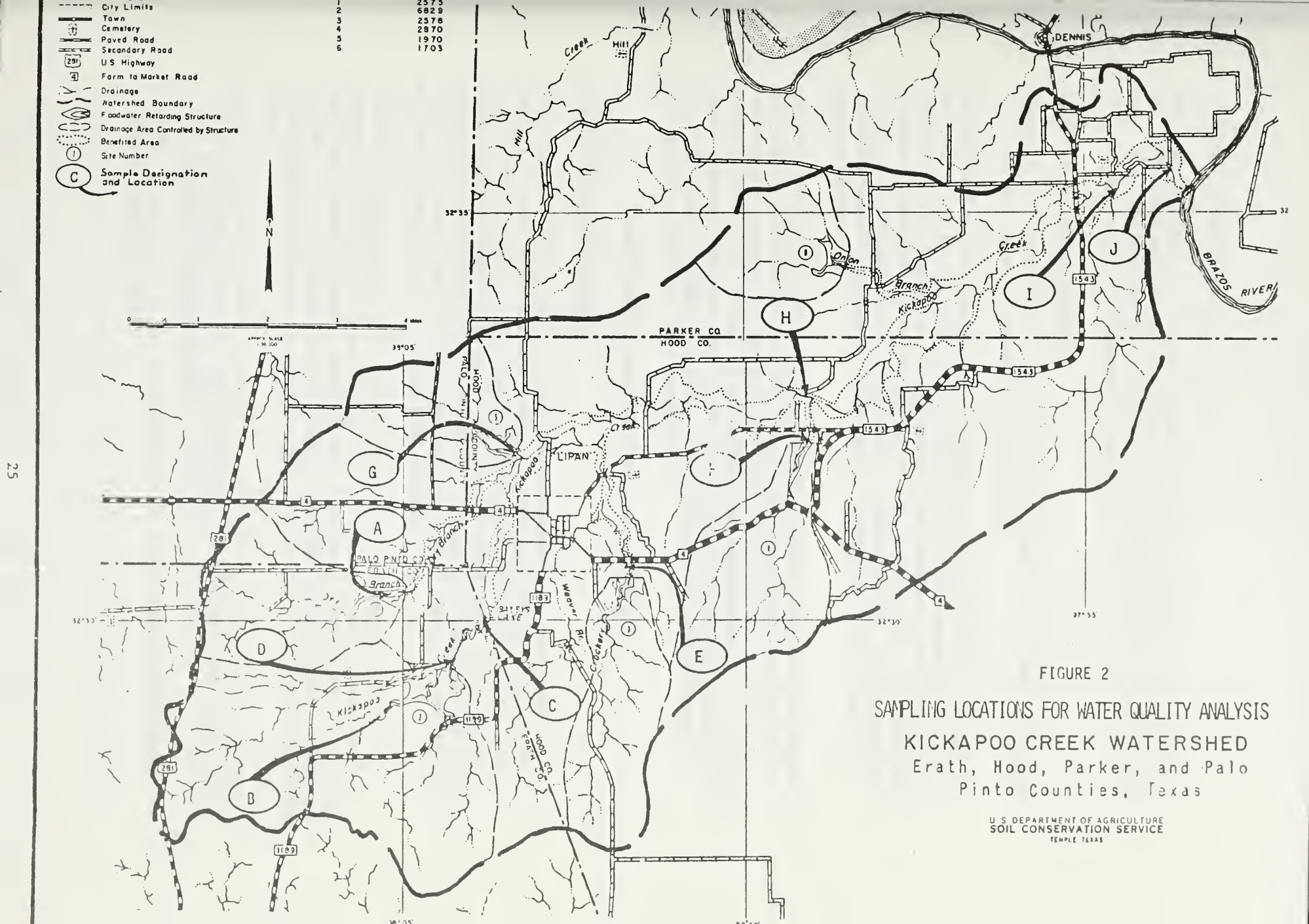


FIGURE 2

SAMPLING LOCATIONS FOR WATER QUALITY ANALYSIS

KICKAPOO CREEK WATERSHED

Erath, Hood, Parker, and Palo Pinto Counties, Texas

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE TEXAS



Kickapoo Creek Watershed, Texas

The concentrations of total dissolved solids, chloride, and sulfate are 501-1,000 milligrams per liter, 251-500 milligrams per liter, and less than 250 milligrams per liter, respectively, in the Brazos River at the confluence of Kickapoo Creek. 1/

Projects of Other Agencies

There are no existing or proposed water resource development projects of any other agencies within the watershed.

DeCordova Bend Dam, completed in 1969 by the Brazos River Authority, is located on the Brazos River about eleven miles downstream from Granbury. The resultant impoundment, Lake Granbury, extends upstream to about two miles below the mouth of Kickapoo Creek. The reservoir provides 44,600 acre-feet of sediment storage and 105,400 acre-feet of conservation storage for municipal, industrial, and irrigation water supplies. 2/

The works of improvement included in the project will have no known detrimental effects on any existing or proposed downstream works of improvement, and will constitute a harmonious element in the full development of the Brazos River Basin. The application of the planned land treatment and the installation of the six floodwater retarding structures will reduce sediment in the Brazos River and sediment accumulation rates in Lake Granbury.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

There is a constant need to apply and maintain land treatment that reduces or controls erosion. The deep sandy and silty soils of the Cross Timbers Land Resource Area (57 percent of the watershed) are inherently susceptible to water and wind erosion when cultivated or overgrazed. In addition, the sandstone, clay, and conglomerate bedrock under these soils are generally very poorly indurated and highly subject to accelerated erosion when denuded.

Erosion problems have been controlled on much of the watershed by changing the land use from cropland to grassland. This change has resulted primarily from a shift from a cash crop economy to a livestock economy. It is imperative that sound conservation practices by applied by landowners and operators to control erosion on upland and flood plain areas.

1/ U.S. Geological Survey, Water-Resources Investigations, The Quality of Surface Waters in Texas, July, 1974.

2/ "The Texas Water Plan" - November 1968, Texas Water Development Board, Austin, Texas.

Kickapoo Creek Watershed, Texas

Floodwater Damage

The flood plain consists of 2,960 acres excluding stream channels. This is the area that will be inundated by a 100-year frequency flood.

Flooding occurs frequently and causes moderate to severe damages to crops, pastures, fences, farm improvements, public roads, and bridges. Major floods, inundating more than half of the flood plain, occur on the average of once every three to four years. Minor floods, inundating less than half of the flood plain, occur on the average of two or three times a year. Cumulative totals of recurrent flooding show an average of 1,203 acres flooded annually during the evaluation period. Damage to flood plain lands from deposition of sediment and flood plain scour has resulted in reduction of crop yields and caused some shift of cultivated land to pastureland and hayland. The deposition of debris is also a problem.

Over half of the flood plain lands are utilized far below their potential. Because of frequent flooding, farm and ranch operators are not able to establish improved grasses, plant high producing feed crops, or fertilize to any significant extent on much of the flood plain because flooding may occur at any time and result in severe damage or reduce greatly the effectiveness of fertilizer and other monetary inputs associated with management practices.

The most disastrous flood in recent years occurred April 27-28, 1957. The total rainfall recorded at Lipan was 5.67 inches. 1/ This was in addition to prior rains that fell during the period of April 20-26, when 3.58 inches was recorded. The recurrence interval of the resulting flood peak was estimated to be about 25 years. Floodwaters inundated approximately 2,675 acres of flood plain. Damage to crops, pasture grasses, fences, other agricultural properties, and roads and bridges was severe. Over 40 percent of the flood plain was damaged by deposition of infertile sediment or scour. Numerous county roads were closed, some for several weeks before repairs could be made. Under the present level of development, the direct monetary floodwater damage from such a flood is estimated to be $122,040.

Other recent large floods that caused extensive floodwater damages occurred in 1967, 1955, 1952, and 1949.

A flood resulting from a 100-year frequency storm event would cause direct floodwater damages in excess of $173,610.

For the floods evaluated, which comprise floods up to, and inclusive of a 100-year frequency event, the total average annual direct floodwater damage is estimated at $34,840. Of this amount, $14,440 is crop and pasture damage, $10,060 other agricultural damage, and $10,340 road and bridge damage.

1/ U.S. Department of Commerce, Weather Bureau, Climatological Data, Texas, April 1957.

Kickapoo Creek Watershed, Texas

Erosion Damage

The estimated annual rate of upland erosion on the watershed averages 2.46 tons per acre. Of this, sheet erosion accounts for 79 percent, gully erosion 17 percent, and streambank erosion 4 percent. Although erosion rates have been reduced greatly by land treatment and land use conversion, there remain small areas where rapid erosion is occurring on cultivated and formerly cultivated fields and on over-grazed grassland. Some active gullying is still taking place, but a definite trend toward rapid healing is evident.

The stream channels are generally in a very stable condition. The only significant channel erosion is found on the outside banks of very sharp meanders. Streambeds are neither aggrading nor degrading noticeably.

Severe erosion has occurred on the soils of the flood plain. Some cropland has been converted to grassland because of frequent and critical soil losses caused by scour. Much of the remaining cropland on the flood plain still suffers moderate to severe scour damage. The damaged areas range from broad sheet scour depressions to narrow channels 0.5 to 3.0 feet in depth. It is estimated that flood plain scour causes a loss of productive capacity on 889 acres which is distributed as follows: 449 acres, 10 percent; 393 acres, 20 percent; and 47 acres, 30 percent. The average annual value of this damage is estimated to be $12,590. Annual recovery from flood plain scour is approximately in balance with new damage.

Sediment Damage

The estimated average annual sediment production rate at the mouth of Kickapoo Creek is 0.88 tons per acre. This amounts to an average annual sediment yield of about 46,000 tons. Sediment derived from the watershed is a source of pollution in the Brazos River, degrading the quality of water for all present and probable future uses. The estimated average suspended sediment concentration at the lower end of the watershed is 1,800 milligrams per liter based on 2.09 inches of average annual runoff from the watershed. No estimate of monetary damage as a result of this concentration has been made.

The storage capacity of Lake Granbury on the Brazos River is depleted by an estimated average of 33 acre-feet annually by sediment derived from Kickapoo Creek watershed. The estimated average annual value of this damage is $3,480.

The storage capacity of Bailey Lake, the present water supply for the town of Lipan, is depleted by an estimated average of five acre-feet annually due to sediment deposition. The estimated average annual value of this damage is $500.

Within the watershed, damaging sediment is deposited on roads and bridges, in farm ponds, and on productive agricultural flood plain land. Deposi-

tion on the flood plain consists primarily of silty sand, fine to medium sand, and silty clay. These deposits, ranging from 0.5 to 3.5 feet thick, primarily overlie fertile clay loam and are estimated to have reduced the productive capacity of 402 acres of flood plain soils as follows: 107 acres, 10 percent; 169 acres, 20 percent; 66 acres, 30 percent; and 60 acres, 40 percent. The average annual value of this damage is estimated to be $8,920.

Field investigations indicate that sediment was deposited on areas of the flood plain at an accelerated rate in the past. It is believed that this condition existed in the 1930's and 1940's when a large percentage of the watershed was cultivated and severe erosion was occurring. As a result of conservation land treatment and the conversion of much cropland to pastureland, the erosion rate and related sediment damages have been reduced greatly. It is estimated that the present rate of overbank deposition is in equilibrium with the rate of recovery.

Indirect Damages

Indirect damages such as interruption of travel, rerouting of school busses and mail routes, disruption of farm operations, business losses in the area, and similar losses are estimated to average $6,030 annually.

Irrigation Problems

Irrigation in the watershed is limited to small areas irrigated on a supplemental basis. Wells in the Twin Mountains Formation are the source of water. During periods of prolonged droughts, these wells generally will not furnish a reliable supply of water. There has been no interest expressed in storing additional irrigation water in surface impoundments.

Municipal and Industrial Problems

The quantity and quality of water from Bailey Lake, the source of water for the City of Lipan, is presently adequate during years of normal or near normal rainfall. The reservoir is fed by spring flow from sands of the Twin Mountains Formation. However, the flow of water stops during prolonged droughts.

Wells in the Twin Mountains Formation are generally not reliable during prolonged periods of drought. This condition exists because the recharge area is a localized outcrop of the formation extending to the west and northwest just beyond the Kickapoo Creek watershed divide and low permeability rates of sand members within the formation.

The population of Lipan is 333. The population and consequently the demand for larger quantities of water are not expected to appreciably increase in the future. However, continued sediment accumulation in Bailey Lake will continue to deplete the present storage capacity of the reservoir and degrade the present quality of the water.

Kickapoo Creek Watershed, Texas

Water Quality Problems

Most of the parameters studied in the water quality study of Kickapoo Creek Watershed (Lipan) were within acceptable limits and indicate good water quality. The item of most concern in the study was the high fecal coliform counts. The rainfall conditions prevalent in the watershed prior to sampling no doubt contributed to washing larger than normal numbers of fecal coliform organisms into the streams. It is encouraging to note that sample C, at Bailey Lake, did have the lowest coliform numbers in the watershed, since Bailey Lake is the water supply for the Lipan community. It is recommended that continued sampling of water, especially at Bailey Lake, be carried out by those with the greatest water quality concerns, such as the Lipan community. Some possible sources of the coliform organisms are improperly installed septic tanks, cesspools, and livestock wastes.

Economic and Social Problems

Additional employment opportunities are needed for the 1,350 unemployed workers in the four county area. The population of Lipan increased from 309 persons in 1060 to 333 persons in 1970. 1/ Further increase in population could be anticipated with a concentrated effort in community development and additional employment opportunities.

ENVIRONMENTAL IMPACT

Conservation Land Treatment and Structural Measures

The installation of the project measures, both land treatment and structural measures, will achieve the project objectives of watershed protection and flood prevention.

The application of the planned land treatment measures will improve the productivity of the soil by reducing erosion and improving the fertility and infiltration properties of the soil. The measures will also reduce downstream floodwater and sediment damages by reducing erosion and the peak rate of runoff from the upland. On cropland, the establishment of conservation cropping systems will encourage diversification of type of crops grown which will provide increased year-round cover and food sources for game birds and waterfowl. Rangeland treatment measures include selective removal of undesirable brush from over-used grassland areas and grazing management practices which increase ground cover, productivity, and density of grasses and other palatable forb plants normally found in the plant community. This

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1/ 1970 Census of Population, U.S. Department of Commerce, January 1971.

will enhance the habitat for deer, quail, and turkey, and decrease the habitat for squirrel, raccoon, and some song birds. Ponds installed for watering of livestock will also provide watering spots for wildlife and provide additional potential for developing fisheries.

Management on approximately 1,120 acres of unimproved grassland on the flood plain will be intensified. Approximately 770 acres of this area are in brushy and woody vegetation and will be cleared to increase hay and coastal bermudagrass plantings. This clearing will reduce habitat for wildlife requiring woody and brushy vegetation. Improved pasture and hayland will provide a more dependable feed source for livestock and reduce the expenditures required for the purchase of feed. It is not expected that any of the flood plain land will be shifted from pastureland to cropland; nor is it expected that the project will result in any increase in acreage of crops in surplus supply. The annual application of up to 280 additional tons of fertilizer will not have any impact on the quality of impounded water within the watershed. The additional fertilizer anticipated to be used within the watershed, as a result of project action will be all applied to the flood plain lands benefited by structural measures. None of the benefited flood plain, except about 15 acres above Bailey Lake, is located within the drainage area of any impoundment within the watershed. More intensive use of the flood plain above Bailey Lake is not anticipated because of unsuitable topography.

Research data relative to the effects of fertilizer on the water quality of receiving stream under conditions similar to those in the watershed are not available. Therefore, prediction of the effects of the use of about 280 additional tons of fertilizer can only be based on a rational of factors believed relevant. It is estimated that under non-project conditions about 2,700 tons of fertilizers are being applied within the watershed annually. The 280 tons of additional fertilizer will represent an increase of only about 10.3 percent. Chemical analysis of surface water in the watershed indicated maximum concentration of T-PO4 to be 0.182 mg/l and $N\text{-}NO_3$ to be 0.50 mg/l. Both values are low and in light of the use of 2,700 tons of fertilizer it must be concluded that fertilizer applied at this rate within the watershed has little effect on water quality of streamflow. The additional 280 tons of fertilizer will be applied on the level flood plain lands to improve and support vegetation on pasture and hayland. The establishment of good vegetative cover on this land in conjunction with the reduced frequency, depth, and velocity of floodwaters will reduce flood plain erosion by about 68 percent. Inasmuch as sediments are a major transporter of chemical ions from soils, the concentration of nitrates and phosphates into runoff receiving streams should be less than at present, even with a 10.3 percent increased used of fertilizer.

Application of the planned land treatment is expected to reduce annual gross erosion from 175,300 tons to 156,000 tons, a reduction of approximately 11 percent. Annual flood plain scour damage on 889 acres is expected to be reduced about 68 percent.

When the project is complete, a 66 percent reduction in overbank sediment deposition damage on 402 acres will be effected. Sediment transported in suspension is the major pollutant in the watershed's streams. It is estimated that the concentration of suspended sediment leaving the watershed in average annual surface runoff will be reduced from 1,800 to 1,200 milligrams per liter as a result of the combined program of land treatment and floodwater retarding structures.

Sediment originating in the watershed and deposited in Lake Granbury will be reduced by an average of 12 acre-feet annually, a 36 percent reduction. Bailey Lake, the present water supply for the town of Lipan, will have a prolonged life due to an 80 percent sediment reduction which will amount to an average of four acre-feet annually.

The project will provide protection to 2,960 acres of flood plain land within the watershed and will benefit directly the owners and operators of approximately 50 farms and ranches in the flood plain. In addition, the owners and operators of the flood plain land along the Brazos River below Kickapoo Creek will receive some benefits from the project. Indirect damage reduction benefits will also accrue to the project. These benefits include the reduction or elimination of expenses associated with interruption or delay of travel, rerouting of school buses and mail routes, disruption of farm operations, business losses in the area, and similar losses.

After installation of the combined program of land treatment and structural measures, the average annual flooding will be reduced from 1,203 acres to 423 acres, a reduction of 65 percent.

Average Annual Area Inundated

Evaluation Reach (Appendix C)	Location	Without Project (acres)	With Project (acres)	Reduction (percent)
1	Confluence of Brazos River to VS-K-7	740	320	57
2	VS-K-7 to Structures	463	103	78
	Total	1,203	423	65

Kickapoo Creek Watershed, Texas

The number of acres inundated in each evaluation reach without and with the project by various frequency floods is presented in the following tabulation:

Area Inundated by Selected Recurrence Intervals

Evaluation Reach (Appendix C)	Recurrence Interval: 2-Year Without Project (acres)	2-Year With Project (acres)	5-Year Without Project (acres)	5-Year With Project (acres)	25-Year Without Project (acres)	25-Year With Project (acres)	100-Year Without Project (acres)	100-Year With Project (acres)
1	515	90	1,244	606	1,658	1,260	1,833	1,567
2	326	0	801	134	1,017	509	1,127	657
Total	841	90	2,045	740	2,675	1,769	2,960	2,224

The following tabulation shows effects of the project on flood damages by evaluation reaches. All figures indicate average annual reductions:

Damage Reduction in Percent

Evaluation Reach (Appendix C)	Crop and Pasture	Other Agricultural	Non-Agricultural	Overbank Sediment	Flood Plain Erosion	Total
1	59	68	68	59	62	63
2	81	90	90	76	79	84
Total	67	77	80	66	68	71

A maximum initial reduction in average annual runoff of 186 acre-feet is expected from the effects of evaporation from sediment pools of the floodwater retarding structures. This will result in an initial reduction from 9,084 to 8,898 acre-feet, 2.05 percent, in average annual volume of watershed runoff. This initial water loss will be reduced as sediment accumulates in the sediment pools over the life of the project. The reduction of average annual streamflow into Lake Granbury will be less than 0.08 percent. The quality of runoff from Kickapoo Creek Watershed is good and serves to dilute the more saline water of the Brazos River. The minor reduction in runoff is not expected to have a significant effect on the water quality of the Brazos River. Evaporation losses from the 200 acre-feet of water impounded in the sediment pool of Floodwater Retarding Structure No. 2 will decrease the average annual runoff to Bailey Lake from 1,304 acre-feet to 1,231 acre-feet, a reduction of about six percent.

Except during years of extreme drought, this reduction will have no adverse effects on water availability to support the demand of the community of Lipan. During critical drought periods, Bailey Lake has historically failed to supply even minimum water demand. Under nonproject conditions the water supply available will continue to decrease because of loss in capacity resulting from sediment deposition. The installation of Floodwater Retarding Structure No. 2 will decrease the rate of capacity loss by an average of 80 percent. However, water yield to the lake will be reduced significantly during critical periods and could prolong the periods of inadequate supply for Lipan. The floodwater retarding structure will have appurtenances to release water from the sediment pool to honor downstream water rights. The sponsoring local organizations will have the authority to release water from the sediment pool of the floodwater retarding structure under provisions contained in the land rights instrument to be obtained prior to construction. Reservoir operation studies of the floodwater retarding structure were made for the period of 1948 through 1966, which includes the most critical drought period on record. This study indicated that the minimum water storage available would be about 130 acre-feet. Under like conditions, Bailey Lake would not yield any potable water, even under nonproject conditions. During periods of water shortage in Lipan, the sponsoring local organizations will release water, if available, from Floodwater Retarding Structure No. 2 in a volume adequate to meet minimum needs. This will not only mitigate any adverse effects caused by the installation of the floodwater retarding structure, but during some periods will provide water that otherwise would not have been available.

During construction of the structural works of improvement, air and water pollution will increase slightly from dust and sediment inherent to the construction process. This increase will be kept within tolerable limits. After installation and with the establishment of vegetation for erosion control, pollution from these sources is expected to be at or below preconstruction levels.

The sediment pools of the floodwater retarding structures will provide a dependable water supply for livestock.

The effects of the works of improvement on fish and wildlife habitat are described by the Fish and Wildlife Service (formerly the Bureau of Sport Fisheries and Wildlife) as follows:

> "With the project, the land treatment measures and floodwater retarding structures would reduce the amount of sediment

reaching the Brazos River and DeCordova Reservoir (Lake Granbury), thus improving downstream fish habitat. The floodwater retarding reservoirs would provide more sport fishing in the watershed.

No commercial fishing is expected to develop with the project.

With the project, the structural measures and most land treatment measures generally would aid wildlife. The floodwater retarding reservoirs and farm ponds would provide some resting areas for waterfowl. Land treatment measures such as conservation cropping systems, proper grazing use, and deferred grazing would be beneficial to deer and upland game. Stirring of the soils would stimulate weed growth and thus benefit seed-eating animals. However, increasing the density of grass cover in the project area would decrease the food supply for doves and bobwhites. Indiscriminate brush control could be damaging to wildlife habitat in the watershed."

The water area in sediment pools at the elevations of the lowest ungated outlets will create 148 acres of additional lake fisheries habitat, waterfowl resting places, and water for wildlife. This area will be lost as upland wildlife habitat. The inundation of 4.8 miles of normally dry stream channels will have no significant effect on stream fisheries. Presently the only fisheries associated with stream channels that will be inundated is a scoured out channel area in the pool of floodwater retarding structure No. 2 and a small stock pond located on a tributary channel in floodwater retarding structure No. 1.

The construction of dams and emergency spillway areas will temporarily destroy the wildlife habitat value of 125 acres of which 35 acres are pasture, 42 acres are open rangeland, 44 acres are wooded rangeland, and the remaining 4 acres are cropland. However, dams and spillways will be revegetated immediately with multiple-use plants having value to wildlife.

The vegetative cover and wildlife habitat value of the 636 acres in the floodwater retarding pools will undergo no significant change in composition as a result of project action. Wildlife species inhabiting the detention pools will be subject to temporary displacement when structures function to the extent the detention pools are utilized. However, an increase in growth and density of most existing species is anticipated because of increased moisture resulting from periodic inundation. The project is not expected to significantly affect any threatened species.

The sediment pools of the six floodwater retarding structures will initially impound 977 acre-feet of water below the lowest ungated outlets. It is anticipated that removal of earth fill materials from

the sediment pools for the dams will create 238 acre-feet of the total 977 acre-foot capacity. Due to the expected design of the principal spillways and the uncertainty of the exact locations where these materials will be obtained within the sediment pools, it is anticipated that 238 acre-feet of water will not be available for downstream release. A maximum of 739 acre-feet of water available for streamflow augmentation would provide a very limited duration and volume of streamflow. During drought periods, the release of water from the sediment pools would have a negligible effect on streamflow in Kickapoo Creek.

There are no areas such as feedlots in the watershed with large concentrations of livestock. Livestock within the drainage areas of the floodwater retarding structures are on pastureland and rangeland. Long-time observations at floodwater retarding structures constructed on the same or similar soils and having comparable conditions in their drainage areas have not evidenced a significant degree of fouling of water in the sediment pools by livestock. Therefore, appreciable contamination from livestock to water in the sediment pools is not anticipated.

The installation of floodwater retarding structures will require the commitment of a total of 909 acres of agricultural lands to project purposes. Of this acreage, 80 acres are cropland, 159 acres are pastureland, 161 acres are open rangeland, and 509 acres are wooded rangeland. A total of 273 acres required for dams, spillways, and sediment pools will be retired from agricultural production. Land use of the area to be retired is 8 acres of cropland, 48 acres of pastureland, 80 acres of open rangeland, and 137 acres of wooded rangeland.

Presently there are no known historical or significant archeological locations or artifacts that will be affected by the project. The Department of Anthropology, Archeology Research Program, Southern Methodist University, conducted field surveys on the floodwater retarding sites and stated further investigations were unwarranted.

Economic and Social

The application of the planned land treatment program will result in more efficient use of cropland and grassland which will increase farm and ranch income.

Economic impacts on the local area resulting from the project will include the additional requirements for about 280 tons of fertilizer, as well as additional seed, petroleum products, repair services and some new haying equipment annually. New fencing will be required for proper management of pastures and hay meadows.

The estimated average annual monetary floodwater, sediment, erosion, and indirect damages within the watershed will be reduced from $62,530

to $17,920. This is a reduction of 71 percent. Including sediment damage in Lake Granbury, the damage will be reduced from $66,360 to $20,360, a reduction of 69 percent.

Benefits from the planned land treatment measures other than floodwater, sediment, and scour damage reduction benefits were not evaluated in monetary terms since experience has shown that conservation practices produce benefits in excess of their costs.

Reduction in monetary flood damages vary with respect to locations within the watershed. The following tabulations show the general locations of average annual damage reductions and benefits attributed to the combined program of land treatment and structural measures.

Average Annual Damages and Benefits

Evaluation Reach (Appendix B)	Location	Damages Without Project (dollars)	Damages With Project (dollars)	Reduction (percent)	Benefits (dollars)
1	Confluence of Brazos River to VS-K-7	36,330	13,640	62	22,690
2	From VS-K-7 to Structures	26,200	4,280	84	21,920
-	Granbury Lake (Sediment)	3,830	2,440	36	1,390
Total		66,360	20,360	69	46,000

Direct monetary floodwater damages were determined for each evaluation reach by recurrence intervals. Intervals of 2, 10, 25, and 100-year frequencies for without and with project are presented in the following:

Direct Monetary Floodwater Damages

Evaluation Reach (Appendix B)	Recurrence Interval 2-Year Without Project (dollars)	2-Year With Project (dollars)	10-Year Without Project (dollars)	10-Year With Project (dollars)	25-Year Without Project (dollars)	25-Year With Project (dollars)	100-Year Without Project (dollars)	100-Year With Project (dollars)
1	9,380	1,410	52,260	23,340	71,290	36,230	94,110	59,920
2	6,460	-	40,040	6,540	50,750	14,830	79,500	27,030
Total	15,840	1,410	92,300	29,880	122,040	51,060	173,610	86,950

Net income will increase an estimated $42,700 annually to owners and operators of the flood plain land from more intensive land use.

Incidental livestock water benefits from use of the sediment pools of the floodwater retarding structures are estimated at $2,140 annually. Secondary benefits, from the installation of a complete project for flood prevention, will accrue in the trade area as a result of increased business to those who furnish farming equipment, petroleum products, fertilizer, farm supplies, and various services associated with the farming and ranching community. Increased agricultural efficiency will be realized by the operators of land that will become productive after damaging floods and sediment deposition have been alleviated. The increased agricultural production will provide added income, thereby improving the standard of living. The increased needs of the entire economy will create the equivalent of 21 permanent jobs for local residents. 1/ The operation and maintenance of project measures will also provide employment for local residents. Additional intangible benefits will accrue to the project allowing an opportunity for the shifting of public funds from the repair of damages to county roads and bridges to investment in schools and improving existing roads. Likewise private funds now going to repair of flood damage could be shifted to raising the standard of living of the residents in the affected area. It is estimated that the project will produce local secondary benefits averaging $72,550 annually. Secondary benefits from a national viewpoint 2/ were not considered pertinent to the economic evaluation.

During the construction stage of the proposed project, additional requirements for construction materials, petroleum products, and other necessities will stimulate the economy. The firms contracting for installation of the floodwater retarding structures will employ some of their employees locally. This construction will create approximately 39 man-years of employment, which will further strengthen the economy during the construction phase. 1/

A summary of economic findings is attached as Appendix A.

Erath, Hood, Parker, and Palo Pinto Counties have not been designated as areas eligible for assistance under the Economic Development Act. Consequently, no redevelopment benefits were considered.

1/ Estimated from an adaptation of An Input-Output Analysis of the Texas Economy Emphasizing Agriculture, Lonnie L. Jones and Gholam Mustafa, Texas A&M University, November 1971.

2/ Estimated from an adaptation of An Input-Output Model of the North Central Region of Texas, Texas Interindustry Project, Office of the Governor, Division of Planning Coordination, April 1972.

FAVORABLE ENVIRONMENTAL EFFECTS

1. Average annual flooding will be reduced from 1,203 acres to 423 acres, a reduction of 65 percent, which will allow approximately 50 owners and operators to carry on more efficient and profitable farm and ranch operations.

2. The interruption and delay of travel, rerouting of school busses and mail routes, disruption of farm operations, and associated business losses due to flooding in the watershed will be eliminated or greatly reduced.

3. Erosion will be reduced on uplands by about 11 percent.

4. Sediment and scour will be reduced on flood plain lands 66 percent and 68 percent, respectively.

5. Sediment pollution in the Brazos River and Lake Granbury will be decreased.

6. Land treatment will prolong the usefulness of the present source and help maintain the quality of the water supply for the City of Lipan by reduction of sediment yielded to Bailey Lake.

7. Fish and wildlife habitat will be enhanced by providing:

   a. An additional 148 acres of fish habitat in the floodwater retarding structures' sediment pools,

   b. Additional sources of drinking water,

   c. Nesting and resting areas for waterfowl,

   d. More and better food plants from land treatment for upland game, and

   e. Flood protection for ground-nesting birds and burrowing animals in the flood plain.

8. The impoundments in the floodwater retarding structures' sediment pools will provide a potential for more sport fishing in the watershed.

9. A dependable water supply for livestock can be provided from the floodwater retarding structures' sediment pools.

10. Safety hazards at low water crossings will be reduced.

11. Economic activity in the local area will be increased by $160,390 annually.

12. A need for 21 few full-time jobs as a result of increased production, and 39 man-years of employment for installation of structural measures during the installation period will be created.

ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

1. Dust and sediment pollution will increase slightly during construction of structural works of improvement.

2. Inundated areas in the sediment pools (148 acres) will be lost as upland wildlife habitat.

3. The construction of dams and emergency spillways will alter existing wildlife habitat on 125 acres.

4. Food supply for quail, dove, song birds, squirrel, deer, and furbearing animals will be reduced from the destruction of present habitat on the areas required for dams, emergency spillways, and sediment pools.

5. An increase in the density of grass cover in the project area will decrease the food supply for dove and bobwhite quail.

6. The clearing of 770 acres of brushy and woody vegetation to establish hay and coastal bermudagrass plantings on the bottomland will decrease wildlife habitat for squirrel, deer, furbearers, and some non-game birds.

ALTERNATIVES

The considered alternatives to the proposed project action were: (1) an accelerated program of applying land treatment measures for watershed protection; (2) changing the present use of flood plain land to uses that are less susceptible to damage by flooding; and (3) foregoing the implementation of a project.

A discussion of each alternative follows:

Alternative No. 1

This alternative consisted of applying the land treatment measures as proposed in the project action. Most of the impacts of the application of land treatment measures are discussed under environmental impact of the proposed action. Average annual damages from floodwater would be reduced by about 4.9 percent in downstream areas. The volume of sediment being delivered to the mouth of the watershed would be reduced from 36 acre-feet annually to 33 acre-feet, a reduction of 8 percent. Sediment originating in the watershed and deposited in Lake Granbury would be reduced from 33 acre-feet to 30 acre-feet annually, a 9 percent reduction.

Deposition of sediment in Bailey Lake would be reduced from 5.0 acre-feet to 4.0 acre-feet annually. This alternative would have little effect in reducing flood plain scour on cultivated land and in reducing the volume of sediment produced by this process. The adverse impacts caused by installation of the floodwater retarding structures would be eliminated. The estimated cost of this alternative is $461,300.

Alternative No. 2

This alternative consisted of changing the present use of the land to one that is less susceptible to damage by flooding.

The potential land uses, listed in order from highest to lowest susceptibility to flood damage, are cropland, pastureland, and rangeland. Land used for other purposes, such as transportation systems, is damaged to varying degrees by flooding, depending upon the type of development and depth and duration of flooding.

In order to substantially reduce the need for flood protection, it would be necessary to convert 1,027 acres of cropland to a land use less susceptible to floodwater damage. With this alternative it is anticipated that about 80 percent of the cropland would be converted to improved pastureland and about 20 percent would revert to native vegetation. This alternative would significantly reduce the actual monetary damage caused by floodwater, sediment, and erosion. Changing from cropland to improved pastureland would decrease the food supplies for dove, quail, and non-game species on about 822 acres of land. Wildlife habitat and cover on about 205 acres which would revert to native vegetation would be improved. Damages to the transportation system would continue at about the same rate because it would be impractical to move the system out of the flood hazard area. The economic returns to land users of 2,960 acres of agricultural land in the flood hazard area would be reduced by about $46,000 annually if the land use was changed to improved pastureland and native grassland.

Alternative No. 3

Alternative No. 3 consisted of foregoing the implementation of a project.

This would delay the application of land treatment measures, which would delay the impact these measures have on reducing sediment production from the watershed and would also delay the impact these measures have in reducing flood damage. It is reasonable to expect however, that landowners and operators would eventually install the land treatment measures to maintain the productivity of their lands.

Flooding would continue, resulting in damage to agricultural land and the transportation system. The deterioration of the

cultivated flood plain soils by scour would continue until the cumulative effect of this damage forced land use conversion to less productive uses. Areas subject to scour and streambank erosion would continue to produce sediment.

The need to use 909 acres of land for the installation of the structural measures and resultant adverse impacts would be eliminated.

The opportunity to realize about $104,140 in average annual net benefits would be foregone.

Several systems of floodwater retarding structures were evaluated in developing the work plan. In selecting potential sites for floodwater retarding structures, consideration was given to locations which would provide the agreed upon level of protection to areas subject to damage. The size, number, design, and cost of the structures were influenced to a high degree by the physical, topographic, and geologic conditions in the watershed.

Investigations were made for the feasibility of a multiple-purpose structure for Lipan. Floodwater retarding structure No. 2 and an alternate site approximately one mile downstream near Bailey Lake were investigated in detail for this purpose. Both floodwater retarding structure No. 2 and the downstream alternate site have the potential for water impoundment. It was determined that municipal water could be supplied by a multiple-purpose structure at either of the elected sites. The basic site information for multiple-purpose storage was reviewed with the sponsoring local organizations at several meetings. After considerable evaluation of the alternatives, the sponsors decided not to include municipal water storage as a purpose at either site location. Financial limitations, limited sources of revenue, low population growth rate, and costs for additional facilities to operate a public water supply system were the major reasons for excluding municipal water storage.

Upon completion of studies to ascertain the location and extent of flood problems, nine structure site locations were selected for evaluation of their effects on watershed problems. Preliminary surveys and investigations were made at site locations on Weaver Branch and Cottonwood Creek. Studies indicated that developed areas within the City of Lipan are not subject to flooding from Weaver Branch by the project evaluation flood and that floodwater damages to agricultural properties on the flood plains of both Weaver Branch and Cottonwood Creek are minor. Control of runoff from these tributaries is not necessary to achieve the desired level of protection along the main stem flood plain of Kickapoo Creek. Therefore, no detailed investigations were made at these locations.

Kickapoo Creek Watershed, Texas

Detailed surveys and investigations made at seven site locations included two alternate locations on Kickapoo Creek. Studies conducted showed that six floodwater retarding structures, including the upper alternate location on Kickapoo Creek, was the most feasible system of structural measures to meet project objectives for flood prevention to flood plain lands at the least cost.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Most of the land in the watershed is used for agricultural production and is not expected to change. The overall projected land use in the watershed at the end of the project installation period is as follows:

Land Use	Acres	Percent
Cropland	8,800	17
Pastureland and Hayland	10,420	20
Rangeland	31,390	60
Miscellaneous *	1,550	3
Total	52,160	100

* Roads, highways, farmsteads, urban areas, stream channel, etc.

The land use change trend of conversion of cropland to pastureland and the increase in pastureland reflects the effects of rising production costs for producing crops on small units of marginal cropland and the increasingly more favorable economic returns being experienced from producing beef and animal products on intensively managed pastureland. The installation or failure to install the project will have little or no effect on this trend. The conservation land treatment program is flexible for meeting the treatment needs of changing land uses in order to protect and improve the soil, water, and vegetative resources for the future.

The Kickapoo Creek watershed project is within the Brazos River Basin. The Brazos River drains portions of New Mexico and one-sixth of the State of Texas. The total area of the basin is about 44,640 square miles, of which an estimated 9,240 square miles do not contribute surface runoff to the river. The total length of the Brazos River Basin is about 600 miles and the maximum width is 120 miles. 1/ Mean annual precipitation varies from about 17 inches in the upper portion to about 46 inches at the mouth.

1/ Flood Damage Study for Main Stem and Major Tributaries, Corps of Engineers, U.S. Army Districts, Fort Worth, Texas, Galveston, Texas, April 1961, p. 53.

Kickapoo Creek Watershed, Texas

There are 56 watersheds located in the Brazos River Basin on which watershed projects have been installed, approved for operations, or appear to be feasible for planning. Sixteen of the projects are installed or are in the process of being installed, 9 have been approved for operations, 8 are currently being planned, and 23 appear to be feasible for planning. The total drainage area of the 56 watersheds is about 9,300 square miles. The drainage area of these watersheds is about 20.8 percent of the drainage area of the Brazos River Basin. Of the 23 watersheds which appear to be feasible, applications for planning assistance have been made to the Texas State Soil and Water Conservation on 11.

The Texas Water Plan (Summary) indicated that in 1968 there were 33 reservoirs either existing or under construction which have total capacities of 5,000 acre-feet or more. Based on the report of the U.S. Study Commission - Texas, there are about 90 reservoirs, excluding structures installed under the watershed program, in the basin with capacities of less than 5,000 acre-feet.

There are 337 floodwater retarding structures, 3 multiple-purpose structures, and 156.5 miles of channel work constructed or planned in the 25 watershed projects that are installed or approved for operations. It is estimated that if all the remaining projects that appear feasible were installed, a total of about 690 floodwater retarding structures would be constructed and 280 miles of channel work would be installed in the basin.

Kickapoo Creek enters the Brazos River upstream from Lake Granbury and downstream from Possum Kingdom Reservoir. Any cumulative effects resulting from the installation of a project on Kickapoo Creek watershed on the streamflow of the Brazos River will be associated only with other watershed projects that enter the Brazos River between the two reservoirs. The total intervening drainage area between the two reservoirs is about 2,140 square miles. Only two watershed projects impacting on this river reach have been authorized for operations. The 11 planned floodwater retarding structures with a combined drainage area of 52.72 square miles have been constructed. In addition to Kickapoo Creek watershed, one other small watershed project is currently being planned. It is estimated that when all four of these projects are installed a total of 19 floodwater retarding structures will have been constructed. The total drainage area of the constructed and currently being planned floodwater retarding structures is about 88 square miles, or 4.11 percent of the total contributing area between Possum Kingdom Reservoir and Lake Granbury. The cumulative effect of watershed development, authorized and being planned currently, is small. It is estimated that the cumulative decrease in average annual runoff to Lake Granbury that originates within the intervening drainage area will initially be about 0.19 percent.

It is anticipated that the works of improvement proposed in this project, along with works of improvement in the projects which are authorized for construction, will have significant impacts on the quality of the human environment. The long-term cumulative impacts of the projects in the Brazos River Basin and the region are as follows. The works of improvement, both land treatment and structural, will help contribute to conservation, development, and productive use of the soil, water, and related resources. The projects will allow the productivity of the resources to be sustained economically and indefinitely. The standard of living of the residents of the region will be improved through added income. The projects will restrict the use on the land needed for installation of the works of improvement. Until impounded water is displaced by sediment, vegetation will be destroyed on areas to be dedicated for sediment storage. Vegetation will be temporarily disturbed on areas needed for construction of dams and emergency spillways. This will adversely affect the wildlife in the immediate site areas. However, the overall habitat conditions are expected to become more favorable as a result of a more dependable food and water supply and better management techniques. The 148 acres of surface water that will be created by this project and the 11,287 acres of surface water that will be created by the projects either installed or approved for operations will provide a total of 11,339 acres of surface water which can be used for recreation, lake fisheries, waterfowl resting areas, etc.

The long-term habitability and contribution to the economic well-being of the area will be improved with only minimal detriment to a few features of the existing environment. In total, the natural environment and aesthetic values of the area will be benefited over those that would exist in the long term without project measures.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The project will commit about 909 acres of agricultural land to the construction and functioning of the floodwater retarding structures. Of this acreage, 80 acres are cropland, 159 acres are pastureland, 161 acres are open rangeland, and 509 acres are wooded rangeland. A total of 273 acres required for dams, spillways, and sediment pools will be retired from agricultural production. Land use of the area to be retired is 8 acres of cropland, 48 acres of pastureland, 80 acres of open rangeland, and 137 acres of wooded rangeland.

The commitment of labor and material resources will be irretrievable.

Installation of the six planned floodwater retarding structures will require about 148 acres of existing wildlife upland habitat for sediment pools. About 761 acres needed for dams, emergency spillways, and detention pools will be dedicated to project purposes and will be available as wildlife habitat for the life of the project.

No other permanent commitment of resources is known to be required for this project.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

General

The plan was developed in full consultation and cooperation with all interested agencies and individuals. Prior to the initiation of planning and during the planning phase, informational meetings were held. These meetings were conducted in the watershed by local organizations. The initial meeting, held in Lipan, Texas, and attended by 75 interested citizens, was sponsored by a local civic organization. It was recognized at this meeting that favorable public opinion toward a watershed project was needed before submitting an application for planning assistance to the Texas State Soil and Water Conservation District Board. It was also emphasized at this meeting that under the auspices of Public Law 566, a watershed project would be a local endeavor with federal assistance. With the ensuing endorsement by those present to take positive action, the Kickapoo Creek Watershed Association was formed to serve as a steering committee to draft an application for planning assistance and to coordinate and carry out local responsibilities during planning.

Subsequent meetings were held by the sponsoring local organizations to inform the general public and involved landowners and to gain opinions and information from interested individuals. A tour and hearing was conducted to observe the status of land treatment, damages from past floods, and potential benefited areas from a flood prevention program. Landowners and operators were shown how their properties were involved in potential floodwater retarding structures with the use of maps and on-site observations.

Newspapers serving the watershed area published articles announcing public meetings and reported information and conclusions resulting from the meetings. In addition, those individuals whose land was directly involved with potential floodwater retarding structures were notified and invited on an individual basis to attend meetings.

Written notification of initiation of work plan development was sent to all federal, state, and local agencies that might have an interest in the project, soliciting information, comments, and participation. Contacts were made with several agencies during planning to obtain information and assistance. The Fish and Wildlife Service and the Texas Parks and Wildlife Department participated in a wildlife survey of the watershed and furnished a report of findings and anticipated project effects. The Archeology Research Program of the Department of Anthropology, Southern Methodist University, carried out field surveys to locate and evaluate any archeological resources that would be affected by the construction of the floodwater retarding structures.

On July 24, 1973, prior to the preparation of the final plan, a public information meeting was held in Granbury, Texas. The proposed project and the environmental statement were discussed and interested agencies and individuals were given the opportunity to present their views and recommendations, either orally or in writing. The plan and environmental impact statement were prepared considering the comments and recommendations offered by the agencies who reviewed the plan.

The following federal agencies were requested to review and submit comments and recommendations:

U. S. Department of the Army
U. S. Department of Commerce
U. S. Department of the Interior
U. S. Department of Health, Education, and Welfare
U. S. Department of Transportation
Environmental Protection Agency
Federal Power Commission
Advisory Council on Historic Preservation

The following state and local agencies were requested to review and submit comments and recommendations:

Division of Planning Coordination (State Agency designated by Governor and State Clearinghouse)
North Central Texas Council of Governments (Regional Clearinghouse)

Discussion and Disposition of Each Comment on Draft Environmental Impact Statement

All of the agencies requested to comment on the Draft Environmental Impact Statement submitted comments except the U. S. Department of Commerce and the Federal Power Commission. The responding agencies' comments and the disposition of each are as follows:

U. S. Department of the Army

Comment: The Department reviewed the work plan and foresaw no conflict with any projects or current proposals of the Department of the Army.

Response: Noted

Comment: The Department believes that questions were left in the Draft Environmental Impact Statement and Work Plan relating to the effects of the proposed project on the habitats of endangered species and the degree to which the proposed action may affect survival prospects.

Response: Appropriate sections concerned with threatened species have been revised to include additional data on species and the expected project effects on such species.

Comment: The periodic inundation of reservoir lands by storage of floodwater would have an adverse impact on wildlife inhabiting these areas.

Response: The Final Environmental Impact Statement and Work Plan have been revised to indicate that wildlife species inhabiting the detention pools will be displaced when structures function at their designed capacity.

U. S. Department of the Interior

Comment: The Department stated that the work proposed in the plan would not adversely affect any unit of the National Park System, or any known historic, natural or environmental education sites eligible for the National Landmark Programs.

Response: Noted

Comment: The Department believes that the project would have no adverse effects on mineral resources.

Response: Noted

Comment: The Department further stated that the proposed project would have no adverse effects on any Bureau of Reclamation projects.

Response: Noted

Comment: The Department noted that the work plan contained six of the recommendations made in the Fish and Wildlife Service (formerly the Bureau of Sport Fisheries and Wildlife) reconnaissance report of May 2, 1969.

Response: Noted

Comment: Alternative No. 2 should be described in a more objective manner. An objective wildlife assessment of the alternative should also include the possible habitat improvements afforded by the measure.

Response: This alternative has been revised and includes more data to describe its impacts on land use and wildlife resources.

Kickapoo Creek Watershed, Texas

Comment: Land treatment measures, including wildlife upland habitat management, have been mentioned and described. Since the implementation of these measures depends upon the land users acceptance, the work plan should state the degree of success anticipated in getting land users to include wildlife measures in their overall management plan.

Response: Appropriate sections of the Work Plan and Final Environmental Impact Statement have been revised to reflect the present status of application of conservation measures which benefit fish and wildlife. Land users will continue to be provided technical assistance in the application of conservation measures which will benefit wildlife. The degree to which these measures will be applied and maintained on a long-term basis can only be estimated. Past records and trends indicate that land users will continue to increase the application of practices which benefit wildlife due to the increased demand for quality hunting and fishing and the potential income from these sources.

Comment: The Department was concerned as to whether or not the land treatment included in the project would actually be applied and suggested that the implementing mechanism (public education, demonstrations, local ordinances, etc.) be included in the Environmental Impact Statement. Also, several impacts of the project are predicated upon the installation of land treatment measures which depends on the land users' commitment to apply these measures.

Response: The ENVIRONMENTAL SETTING, Soil, Plant, and Water Management Status section has been revised to better describe the methods local soil and water conservation districts will use to implement conservation measures. Sources of financial assistance available to land users are included in the Final Environmental Impact Statement. In the absence of land use controls or regulations, there is no legal basis for requiring land users to apply conservation measures. However, an analysis of prior progress in the application of land treatment measures by individual land users in the watershed indicates a constant increase in the rate of application and improvement in the level of maintenance of established measures. Land user awareness of need and interest, particularly in consideration of the total environment, has increased tremendously in the last few years. This fact, in conjunction with the additional technical assistance to be made available during the project installation period, provides a most reasonable basis to believe that land users will accomplish the level of land treatment projected in the project plan.

Comment: The Department believes brush disposal at construction sites could be accomplished in a manner to provide fish and wildlife habitat. It suggested brush piles be anchored to the bottom of the sediment pools or that they be placed around living trees on the perimeter of the flood pools and in eroded areas.

Response: It is acknowledged that brush piles anchored in the sediment pools of floodwater impoundments would provide additional cover for fish. However, brush in sediment pools could constitute a hazard to the function of the primary spillway if it should become dislodged during a period of storm runoff. A major management problem in many small impoundments in this area is population imbalance which occurs as a result of excessive numbers of small sunfish in relation to predatory species such as largemouth bass. Additional hiding and escape cover for small fish would be provided by brush piles and could contribute to population imbalance. It is felt that additional study and consultation on this practice should be undertaken prior to its implementation.

Brush piles placed adjacent to the detention pools would provide cover for bobwhites, cottontails, and ground-nesting songbirds for a limited period of time. As discussed by Jackson, [1/] completely cut brush deteriorates rapidly and soon loses its usefulness as quail habitat.

The areas on which brush piles would be placed are outside of the areas which sponsoring local organizations will obtain easements. If adjacent landowners did not object to the construction of brush piles for esthetic or other reasons and desired to provide brush piles for wildlife, it is felt this practice could be implemented at the time of construction. Brush piles would provide cover for skunks, rodents, snakes, and other predatory species after they have deteriorated. Assistance to land users in the application of wildlife upland habitat management practices such as food and cover plantings is felt to offer the greatest potential for improving wildlife resources in the watershed.

Comment: Consideration should probably be given to discussing the economic return of deer hunting leases under the Economic Data section. Brush removal would adversely impact this resource.

[1/] Jackson, A.S., Quail Management Handbook, Bulletin No. 48, Texas Parks and Wildlife Department, Austin, Texas.

Response: Noted; but under present criteria, no dollar value is put on the economic return of deer hunting leases. Brush removal with wildlife consideration could favorably impact the leasing of hunting lands. Data concerning the amounts of land leased for hunting and average returns from such leases has been added to the Work Plan and Final Environmental Impact Statement.

Comment: The Department stated that in the ENVIRONMENTAL SETTING, Economic Data section, it should be indicated whether or not the per acre value of land includes improvements.

Response: This information has been included as suggested in the Final Environmental Impact Statement and Work Plan.

Comment: The golden-cheeked warbler should be included as a possible summer resident in the watershed. "Peregrine falcon" should be changed to "American peregrine falcon."

Response: These changes have been made in the Work Plan and the Final Environmental Impact Statement.

Comment: The entrapment of livestock in bottom sediments should be mentioned and discussed if there is a possibility for such occurrence.

Response: Entrapment of livestock in sediments constitutes a problem only during periods of extreme drought when livestock are in a weakened physical condition and water is difficult to obtain. Ranchers periodically check water sources or temporarily fence such sources at these times to prevent livestock losses.

Comment: "Feeding areas for waterfowl" should be deleted as an environmental impact or effect. The Fish and Wildlife Service (formerly the Bureau of Sport Fisheries and Wildlife) report of May 2, 1969, stated the floodwater retarding reservoirs would provide some nesting areas for waterfowl. No significant amount of waterfowl feeding is expected to occur.

Response: "Feeding" has been changed to "Nesting".

Comment: The wildlife species expected to be affected by habitat decreases should be noted in adverse environmental effect No. 6.

Response: These species have been added.

Kickapoo Creek Watershed, Texas

Comment: The Department stated that significant adverse impacts related to geologic conditions are not anticipated. It stated further that the statement appears to properly consider impacts of the proposed action on water resources.

Response: Noted

Comment: The Department questioned whether Alternative No.1 is viable since it is dependent on implementation of land treatment measures by private landowners. The Department suggests that mechanisms for land treatment commitments be detailed as much as possible.

Response: See the response to the last comment on page 49. The comment on page 49 and the one on this page are concerned with the dependence of land treatment implementation by private landowners. The respective response on page 49 is addressed to this subject.

Comment: Alternative No. 2, as described, is overly pessimistic. An objective wildlife assessment of the alternative should also include the possible habitat improvements afforded by the measure, such as increased habitat for white-tailed deer and fox squirrels.

Response: See the response to the last comment on page 48. This comment and the one on page 48 are concerned with descriptions of land use and wildlife habitat and the resultant impacts if Alternative No. 2 was implemented. The last response on page 48 is addressed to these subjects.

Comment: The Department commented that the cumulative effect of projects having impacts similar to those of Kickapoo Creek Watershed (Lipan) in the Brazos River Basin should be treated in greater depth. A list of projects and practices does not describe their cumulative impacts.

Response: It is felt that the relationship between LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY section of the Draft Environmental Impact Statement adequately describes the cumulative effects of watershed projects within the Brazos River Basin for the scope of this project.

The Kickapoo Creek Watershed (Lipan) has a drainage area of 81.5 square miles. This is 0.18 percent of the Brazos River Basin, which has a drainage area of

44,640 square miles. To gather and analyze the information suggested in the comment would require much time and effort. This information would indeed be needed for an environmental impact statement on a project which would affect a large portion of the Brazos River Basin.

Comment: The Irreversible and Irretrievable Commitments of Resources section should be expanded to include commitments of wildlife habitat.

Response: This section of the Environmental Impact Statement has been revised to indicate the irreversible impacts of the project on wildlife habitat.

Comment: The Department requested that the Fish and Wildlife Service report accompany the Work Plan when it is submitted to Congress.

Response: The report will accompany the Work Plan as requested.

U.S. Department of Health, Education, and Welfare

Comment: The Department discerned no adverse health effects that might be of significance provided state, county, and local environmental health laws and regulations are followed.

Response: Noted

U.S. Department of Transportation

Comment: The Department had no objection to the project.

Response: Noted

Environmental Protection Agency

Comment: The Agency believes that stream flow should be augmented with water released from the six floodwater retarding structures in times of drought or low-flow conditions. This released water would help maintain and preserve the aquatic life in the creek and deepen permanent pools known to be inhabited by several species of game fish.

Response: All six floodwater retarding structures will have manually operated devices for the release of water impounded in the sediment pools. Initially there will be a maximum of about 739 acre-feet of water impounded in the sediment pools that could be released as stream flow. This available volume of water will gradually decrease with the deposition of sediment in the pool areas until it ceases to exist. During extended drought

periods, the available volume of water could provide a limited duration of streamflow in Kickapoo Creek. The condition of no streamflow and depletion of water in pools during periods of prolonged drought will be the same under nonproject conditions as they will under project conditions. Therefore, any release of impounded water would be for enhancement rather than for mitigation of an adverse impact resulting from the project. Inasmuch as releases for the purposes outlined in the comment would not be for mitigation, the Soil Conservation Service cannot require provisions for release of water for enhancement as a contingent requirement prior to providing financial assistance for project installation.

During extreme drought conditions, sponsoring local organizations in a nearby watershed arranged for water to be released from floodwater retarding structures in order to replenish stream pools. Inasmuch as the residents and all governmental units within the Kickapoo Creek watershed are extremely cooperative in all community activities, it is reasonable to expect that arrangements will be made by the sponsoring local organizations to release some water during critical periods.

Comment: Assurances should be given that adequate facilities for releases from Structure No. 2 to Bailey Lake will be provided. More information discussing the availability of runoff to Bailey Lake below Structure No. 2 should be presented.

Response: More information has been added to appropriate sections of the Final Environmental Impact Statement and Work Plan relative to release of water impounded in Floodwater Retarding Structure No. 2 and availability of runoff to Bailey Lake after construction of the floodwater retarding structure.

Comment: The section, Projects of Other Agencies, of the Work Plan should be included in the Environmental Impact Statement.

Response: This addition has been made.

Comment: The anticipated schedule for the construction of the floodwater retarding structures during the eight-year installation period should be contained in the Environmental Impact Statement.

Response: A description listing the order of construction for the six floodwater retarding structures was included on page 8 of the Draft Environmental Impact Statement. This description is also included in the Final Environmental Impact Statement.

Comment: The Agency commented that the Draft Environmental Impact Statement discussed several precautions that will be followed during construction operations. However, the Agency believes that the possible effects of construction operations on water quality, especially that of Bailey Lake should be fully evaluated in the final statement.

Response: Additional discussion has been included in the Final Environmental Impact Statement and Work Plan relative to precautions that will be taken to protect the quality of water in Bailey Lake during construction of Floodwater Retarding Structure No. 2. Discussion has also been added concerning the effects of construction of Floodwater Retarding Structure No. 2.

Comment: Substantiation of the contention that the annual application of up to 280 additional tons of fertilizer will not have a significant impact on the quality of impounded water within the watershed is needed in the Final Environmental Impact Statement.

Response: Additional data and discussion have been added to the Final Environmental Impact Statement and Work Plan relative to application of fertilizer related impacts on impounded water in the watershed.

Comment: Additional information describing the existing water quality of Kickapoo Creek, Bailey Lake, and the Brazos River should be contained in the Final Environmental Impact Statement. Water quality parameters such as dissolved oxygen, pH, total dissolved solids, etc. should be listed for these waters. The potential long-term effects of the project on water quality of Bailey Lake, Kickapoo Creek, and the Brazos River should be more fully discussed in the Final Environmental Impact Statement.

Response: Water quality data have been added to appropriate sections of the Final Environmental Impact Statement and Work Plan. These data include the water quality data parameters suggested and relate to presently impounded water in the watershed (farm ponds and Bailey Lake), streamflow in Kickapoo Creek and its tributaries, and the Brazos River. It is not anticipated that installation of the project will have significant impacts on water quality other than

those that were included in the Draft Environmental Impact Statement and Work Plan. These impacts are also included in the Final Environmental Impact Statement and Work Plan.

Advisory Council on Historic Preservation

Comment: The Advisory Council suggested that the Final Environmental Impact Statement contain a copy of the comments of the Texas State Historic Preservation Officer concerning the effects of the undertaking upon historical, cultural, archeological, and architectural resources.

Response: Throughout the planning process close liaison was maintained with the Texas Historical Commission (State Historic Preservation Officer). The Commission reviewed and commented on a preliminary draft plan and environmental impact statement previously transmitted. The Commission stated they found no archeological resources on record within the project area, but that significant resources are known in nearby areas. The Commission advised that an archeological survey of the six floodwater retarding structures be scheduled as soon as possible. Subsequently, an archeological survey was conducted by the Department of Anthropology, Archeology Research Program, Southern Methodist University. A copy of the survey report was provided the Commission. The draft plan and environmental impact statement was transmitted to the Commission for comment, through the Governor's Office, Division of Planning Coordination, on February 26, 1974. The Commission did not respond or offer comment.

Office of the Governor, Division of Planning Coordination

Comment: The Division of Planning Coordination stated that review participants generally agreed that the Draft Environmental Impact Statement was in reasonable conformity with the provisions of the National Environmental Policy Act of 1969. Letters of comments from the various State agencies who reviewed the Work Plan and Environmental Impact Statement were enclosed.

Response: Noted. Comments of the review participants and responses are as follows:

Texas Air Control Board

Comment: The Board stated that the impact on air quality of the proposed project is essentially nonexistent.

Response: Noted

Kickapoo Creek Watershed, Texas

Texas Parks and Wildlife Department

Comment: The Department has no additional comments.

Response: Noted

Texas Water Development Board

Comment: The Board expressed no objections to the Work Plan. The Board believes that the runoff that will reach Kickapoo Creek after full implementation of the watershed plan will be reduced by an indeterminate degree. It further states that the influence on the Brazos River Basin downstream from the confluence of Kickapoo Creek will be extremely small--if indeed measurable. The Board noted that some reduction in streamflows is acknowledged in the report.

Response: Noted

Comment: The Board found general agreement with conclusions reached in the Environmental Impact Statement. The Board stated that long-term benefits appear to offset relatively minor adverse effects. It was the Board's opinion that the option selected for implementation is the most practical of the several alterratives discussed.

Response: Noted

Texas Industrial Commission

Comment: The Commission made no negative comments.

Response: Noted

Texas Water Quality Board

Comment: The Board concluded that the proposed project would not pose lasting environmental problems. It noted that assurances were given that adequate sanitary facilities meeting state health standards would be provided at reservoirs prior to any recreational use.

Response: Noted

Texas State Soil and Water Conservation Board

Comment: The Board commented that the Work Plan and Environmental Impact Statement are worthy of endorsement by the State of Texas. It further believes that the Kickapoo Creek Watershed (Liban) project is sound in all respects and concurs with the local peoples' commitment of this project.

Kickapoo Creek Watershed, Texas

Response: Noted

Texas Water Rights Commission

Comment: The Commission believes the cost data in the Work Plan and Environmental Impact Statement should be realistically updated. Mention should be made of the probable overall construction cost differential over the eight-year period during which the project will be in progress.

Response: The project cost data in the Final Work Plan and Environmental Impact Statement have been updated as suggested. There are indications that construction costs will increase in the future; however, the increase can only be estimated. It is also reasonable to assume that benefits will increase; again, the increase can only be estimated. Project costs and economic analysis of the project were developed using current criteria issued by the Water Resources Council. The benefit-cost ratio was calculated based on the latest cost and price data available. Experience indicates that the methods used will provide for this watershed project a representative cost-benefit ratio.

Comment: The Commission requested clarification of the statement in the Draft Environmental Impact Statement: "It is estimated that the cumulative decrease in average annual runoff to Lake Granbury that originates within the intervening drainage area will initially be about 0.19 percent." Considering the 0.19 percent reduction in average annual runoff, it is believed that the sediment retention benefits appear excessive. It does not appear practical that such a low runoff would correspond to a large sediment load.

Response: The 0.19 percent average annual runoff reduction on 2,140 square miles of drainage area between Possum Kingdom Reservoir and Lake Granbury is anticipated with the construction of a total of 19 floodwater retarding structures in four watershed projects.

Sediment deposition in the six floodwater retarding structures included in the Kickapoo Creek Watershed (Lipan) project or in Lake Granbury cannot be directly related to the 0.19 percent reduction in average annual runoff. The sediment reduction benefits enumerated are related only to sediment originating within the Kickapoo Creek Watershed and not the entire drainage area between Possum Kingdom Reservoir and Lake Granbury.

Comment: The Commission stated that Table 6, Watershed Work Plan and Appendix A of the Draft Environmental Impact Statement should correspond. The Commission also stated that the final discount rate should be clarified.

Kickapoo Creek Watershed, Texas

Response: Appendix A of the Draft Environmental Impact Statement has been changed to correspond with Table 6, Watershed Work Plan. Both tables reflect a 5.875 percent discount rate as set by the Water Resources Council.

Comment: Recognition should be given in the Work Plan and Final Environmental Impact Statement to major water rights impacts. Specifically, mention should be made that the project plans and construction will be executed with due regard to the protection of existing water rights and that water rights problems will be resolved with the Texas Water Rights Commission.

Response: These points have been made more clear in the appropriate discussions of the Final Environmental Impact Statement and Work Plan.

Texas Highway Department

Comment: The Department stated that the proposed project apparently will not have any significant effect on the state highway system or any highway projects under development.

Response: Noted

Texas Archeological Research Laboratory

Comment: The laboratory stated that their files have no record of sites that would be affected by the project and apparently the only systematic survey of the area is that of Southern Methodist University mentioned in the draft report. The laboratory further stated that inasmuch as Kickapoo Creek is a permanent stream and a major tributary of the Brazos River, it would seem probable that some sites, particularly buried sites, would be encountered during construction. The laboratory recommended that additional care be taken as work progresses.

Response: Noted

North Central Texas Council of Governments

Comment: The NCTCOG review process disclosed no conflict with the review criteria of areawide comprehensive planning.

Response: Noted

Kickapoo Creek Watershed, Texas

LIST OF APPENDIXES

Appendix A - Comparison of Benefits and Costs for Structural Measures from the Work Plan

Appendix B - Project Map

Appendix C - Letters of Comment Received on the Draft Environmental Impact Statement

APPROVED BY Edward E. Thomas DATE 4/28/75

Edward E. Thomas, State Conservationist

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Kickapoo Creek Watershed, Texas
(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/					Average Annual Cost 2/	Ratio
	Reduction	More Intensive Land Use	Incidental Livestock Water	Secondary	Total		
Floodwater Retarding Structures Numbers 1 through 6	43,000	42,700	2,140	72,550	160,390	49,690	3.2:1.0
Project Administration						6,560	
GRAND TOTAL	43,000 3/	42,700	2,140	72,550	160,390	56,250	2.9:1.0

1/ Price Base: Nonagricultural benefits - current prices (1974); all other benefits - current normalized prices.

2/ Installation: 1974 prices amortized for 100 years at 5.875 percent interest; O&M: current prices (1974).

3/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of $3,000 annually.

APPENDIX A

December 1974

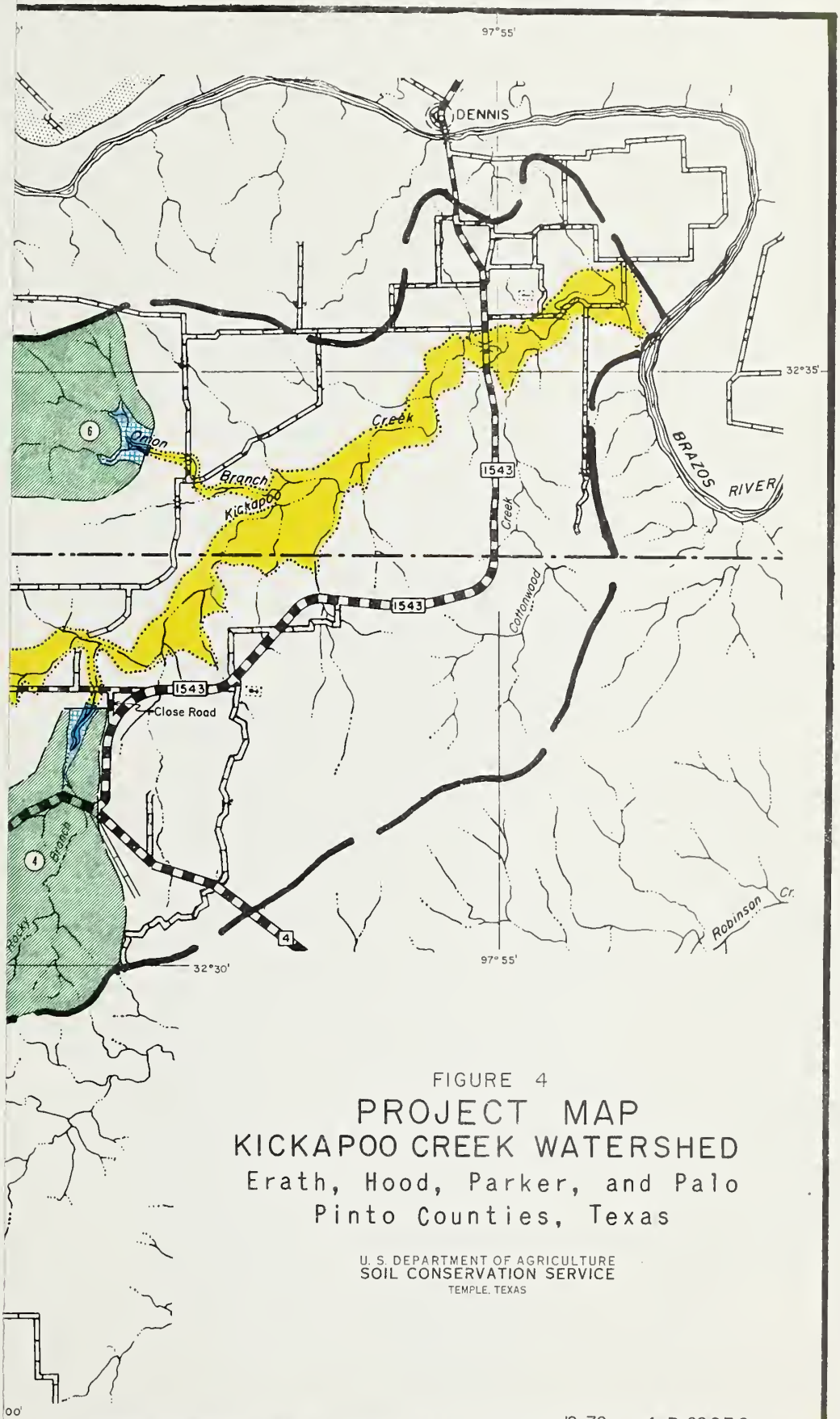


FIGURE 4

PROJECT MAP
KICKAPOO CREEK WATERSHED
Erath, Hood, Parker, and Palo Pinto Counties, Texas

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

12-72 4-R-29879

Rev. 12-71 4-R-19698

LEGEND

- County Line
- City Limits
- Town
- Cemetery
- Paved Road
- Secondary Road
- US Highway
- Farm to Market Road
- Drainage
- Watershed Boundary
- Floodwater Retarding Structure
- Drainage Area Controlled by Structure
- Benefited Area
- (1) Site Number

Site Numbers and Drainage Areas in Acres

SITE NUMBERS	ACRES
1	2575
2	6829
3	2578
4	2870
5	1970
6	1703

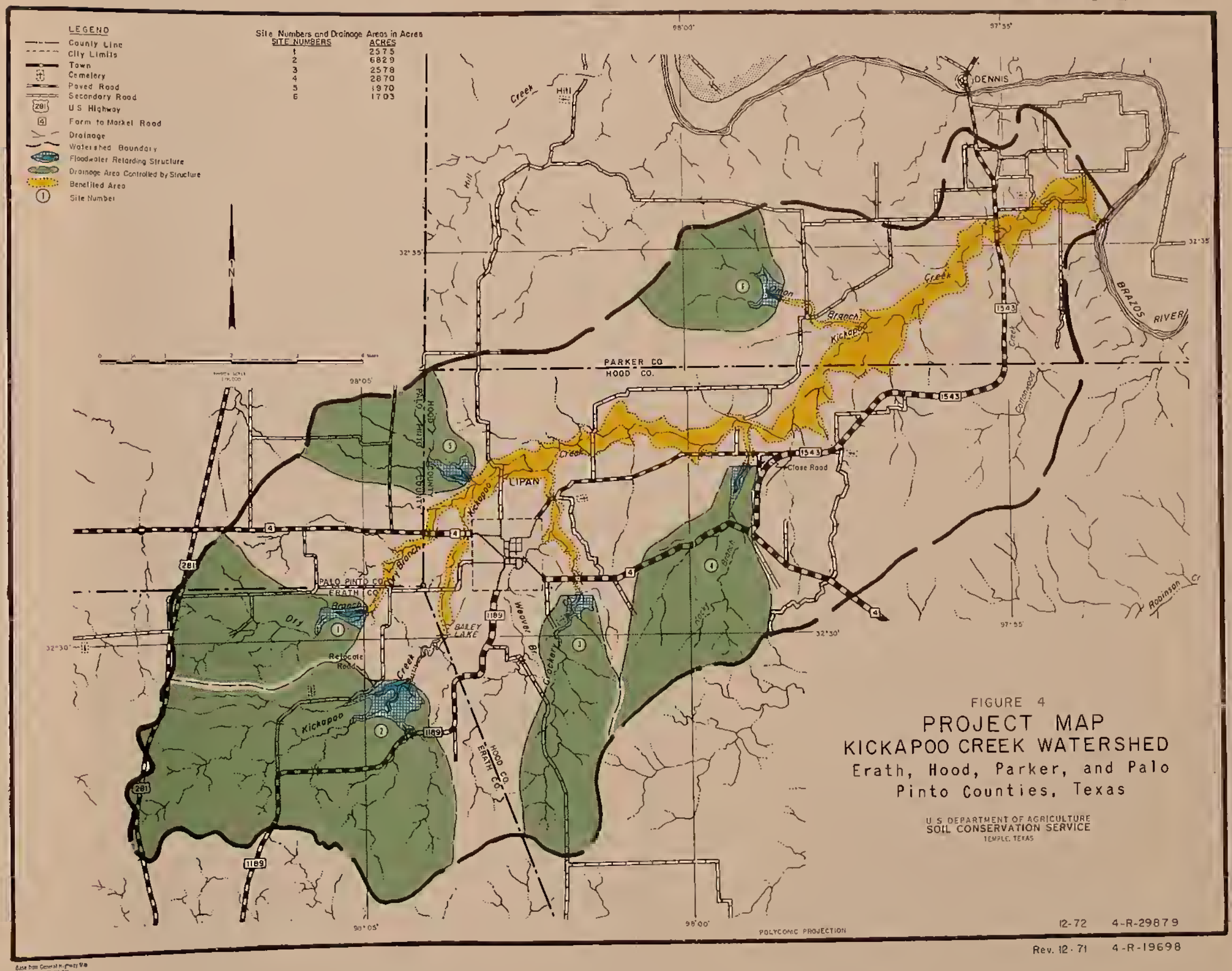


FIGURE 4

PROJECT MAP
KICKAPOO CREEK WATERSHED
Erath, Hood, Parker, and Palo Pinto Counties, Texas

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

12-72 4-R-29879

Rev. 12-71 4-R-19698

APPENDIX C

Letters of Comment Received on the
Draft Environmental Impact Statement

DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 20310

1 MAY 1974

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83rd Congress, the Administrator of the Soil Conservation Service, by letter dated 31 January 1974, requested the views of the Secretary of the Army on the Watershed Work Plan and Draft Environmental Statement for the Pickapoo Creek Watershed (Lipan), Texas.

We have reviewed the work plan and foresee no conflict with [illegible] or current proposals of this Department. Comments concerning the draft environmental statement are inclosed. Subject to consideration of these comments the statement is considered satisfactory.

Sincerely,

Charles R. Ford
Chief
Office of Civil Functions

1 Incl (dupl)
As stated

COMMENTS ON ENVIRONMENTAL ASPECTS
OF
KICKAPOO CREEK WATERSHED WORK PLAN

The following comments pertain to the environmental statement on page 19, last paragraph: "The watershed is within the winter range of the Peregrine Falcon and Southern Bald Eagle and on the western edge of the migration route of the Whooping Crane. These birds are all considered to be endangered species." Since no further mention is made of this subject, readers may be left with questions relating to the effects of the proposed project on the habitats of these species and the degree to which the proposed action may affect survival prospects. Some consideration should be made for clarifying this potential question as implementation of this plan will offer some disruptions during the construction phase. However, the completed plan will probably be an improvement over existing conditions for these species. In addition the periodic inundation of reservoir lands by storage of flood water would have an adverse impact on wildlife inhabiting these areas. This should be discussed in the final statement.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-74/182

APR 15 1974

Dear Mr. Grant:

Thank you for your letter of January 31, 1974, requesting our views and comments on the work plan and draft environmental statement for the Kickapoo Creek Watershed, Texas. We have the following comments on both documents.

Work Plan

The work proposed in this plan will not adversely affect any existing, proposed, or known potential unit of the National Park System, or any known historic, natural, or environmental education sites eligible or considered potentially eligible for the National Landmark Programs.

Both documents state that ample raw materials for construction of dams probably are available from spillway or sediment pool areas and that there are no known mineral resources of economic significance within the watershed.

Our office review, without benefit of a field investigation, can add little to the information on mineral resources. A pipeline that crosses the watershed from east to west would be untouched by structural measures. Oil and gas are produced nearby, but the project would not hamper exploration for, or production of, these resources. Sand and gravel have been produced from several pits in the watershed in past years but not during 1971; however, the project would not affect these pits. Any sand and gravel committed by the project would be insignificant compared with such resources nearby along the Brazos River. We believe the project would have no adverse effects on known or potential mineral resources or their development.

The proposed project would have no adverse effects on any present or potential Bureau of Reclamation projects.

JOHNNY HORIZON '76
Let's Clean Up America For Our 200th Birthday

We note that the work plan contains specific language implementing 6 of the recommendations made in our Bureau of Sport Fisheries & Wildlife reconnaissance report of May 2, 1969. Recommendations concerning the fencing of sediment pools, opening the sediment pools to the public for fee fishing and the establishment of hunting and fishing cooperatives were not adopted. The proposed plan of development would provide 148 acres of fish and waterfowl nesting habitat. Most land treatment measures, including wildlife upland habitat management, would enhance habitat for upland wildlife species within the watershed. Clearing of brush and vegetation for the purpose of increasing the acreage of improved pasture would adversely affect wildlife habitat.

We have the following additional, specific comments.

Page 17, Alternative No. 2, third paragraph - The alternative should be described in a more objective manner. It appears that some cropland and improved pastures could be preserved through the use of crops and grasses less susceptible to losses from flooding. An objective wildlife assessment of the alternative should also include the possible habitat improvements afforded by the measure. Converting some cropland and improved pasture to rangeland and woodland would be beneficial for many wildlife species, including white-tailed deer, squirrel, bobwhite, cottontail, fox, raccoon, and songbirds.

Page 19-27, Works of Improvement to be Installed - Several land treatment measures, including wildlife upland-habitat management, have been mentioned and adequately described. However, since the implementation of these measures will depend upon the landowners acceptance, the work plan should state the degree of success the sponsors and the Soil Conservation Service anticipate achieving in encouraging the landowners to include wildlife measures in their overall management plan.

Environmental Statement

Planned Project - An overriding concern throughout our review of the draft statement was whether or not land treatment practices will be undertaken by the landowner.

None appear to be funded with PL 566 monies, leaving the floodwater retarding structures as the only definite portion of the plan. Page 3, third paragraph, second sentence and page 5, third paragraph state that these measures will be taken but do not give details of the commitment to take them. We suggest that the implementing mechanism (public education, demonstrations, local ordinances, etc.) be discussed to improve the document on this subject.

Several of the environmental impacts listed on pages 31-33 and summarized on the summary sheet are derived from these discretionary land treatment measures; and, without a commitment, there appears to be a certain degree of speculation involved. As an example, favorable impacts 3 and 6, page 32, concern reduced upland erosion and downstream sediment accumulation. The measurable extent to which these impacts will occur is based on just how committed the local land owners are to conservation land treatment measures.

Page 9, first complete paragraph, last sentence - Brush disposal at construction sites could be accomplished in a manner to provide fish and wildlife habitat. Brush piles anchored to the bottom of the sediment pools would provide concentration points for fish. Brush piled around living trees on the perimeter of the flood pools and in eroded areas would also provide additional cover for bobwhites, cottontails, and ground nesting songbirds.

Environmental Setting

Under the economic data section, we suggest that the economic importance of hunting leases should be discussed. Hunting leases provide a significant source of income to landowners, especially in Erath and Palo Pinto Counties. A Texas Parks and Wildlife Department survey, conducted in 1971, indicated approximately 44 percent of the hunting lands in Erath County and 73 percent of similar lands in Palo Pinto County were under hunting lease agreement. Hood and Parker Counties has 6 and 11 percent, respectively.

In the same section, page 18, fifth paragraph, it should be indicated whether or not the per acre value of land includes improvements.

Page 19, Fish and Wildlife Resources - The golden-cheeked warbler should be included as a possible summer resident in the north central and southwestern edges of the watershed. The species is designated as threatened by the Bureau of Sport Fisheries & Wildlife in Resource Publication No. 114, Threatened Wildlife of the United States. "Peregrine falcon" should be changed to "American peregrine falcon."

Consideration should probably be given to discussing the economic return of deer hunting leases under the economic data section. It can be further noted that brush removal would adversely impact this resource.

Environmental Impact

Page 28, second paragraph, indicates the favorable impact of dependable livestock water supply. However, the entrapment of livestock in bottom sediments should be mentioned and discussed if there is a possibility for such occurrence.

On page 33, item 7(c). "Feeding Areas for Waterfowl" should be deleted as an environmental impact or effect. The Bureau of Sport Fisheries & Wildlife report of May 2, 1969, stated the floodwater retarding reservoirs would provide some nesting areas for waterfowl. Unless the structures are managed for waterfowl, no significant amount of waterfowl feeding is expected to occur.

Page 33, first paragraph, No. 6 - The wildlife species expected to be affected by habitat decreases should be noted.

No significant adverse impact related to geologic conditions is anticipated. Also, the statement appears to consider properly impacts of the proposed action on water resources.

Alternatives

Alternative No. 1 is totally dependent on implementation of land treatment measures by private landowners. As noted earlier in this letter, we are not assured by the draft statement that land treatment will be successfully implemented as a complement to structural measures. Therefore, we question whether or not this alternative can stand as a viable alternative. We reiterate our suggestion that mechanisms for land treatment commitments be detailed as much as possible in the draft statement.

Alternative No. 2, as described, is overly pessimistic. Surely some cropland and improved pastures could be preserved. Furthermore, an objective wildlife assessment of the alternative should also include the possible habitat improvements afforded by the measure, such as increased habitat for white-tailed deer and fox squirrels. With Ft. Worth only 55 miles distant, this alternative might be evaluated in greater depth and with more optimism due to its possible production of recreational income to landowners.

Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Ennancement of Long-Term Productivity

The cumulative effect of projects having impacts similar to those of the Kickapoo Creek in the Brazos River drainage should be treated in greater depth. For instance, how many acres out of an existing total will be:

1. Lost from cropland, pastureland, hayland;
2. Converted from wooded rangeland to open rangelard;
3. Converted from various other uses to damsites, floodpools, sediment pools, etc.; and
4. Changed from providing a critical element in the annual cycle of wildlife needs.

A mere listing of projects and practices does not describe their cumulative impacts.

Irreversible and Irretrievable Commitments of Resources

The draft statement is generally adequate in its description of the environmental impact. However, irreversible and irretrievable commitments of wildlife habitat were not discussed. This section should be expanded to include this information.

It is requested that the enclosed Bureau of Sport Fisheries and Wildlife report accompany the work plan when it is submitted to Congress. We hope these comments will be helpful in preparing the final environmental statement for this project.

Sincerely yours,

Royston C. Hughes

Assistant Secretary of the Interior

Mr. Kenneth E. Grant
Administrator
U.S. Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250

Enclosure

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGIONAL OFFICE
1114 COMMERCE STREET
DALLAS, TEXAS 75202

March 5, 1974

Deputy Administrator for Water Resources

OFFICE OF
THE REGIONAL DIRECTOR

Our Reference: EI # 0274-321

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
Department of Agriculture
Washington, D.C. 20250

Re: Kickapoo Creek Watershed, Texas

Dear Mr. Grant:

Pursuant to your request, we have reviewed the Environmental Impact Statement for the above project proposal in accordance with Section 102(2)(C) of P. L. 91-190, and the Council on Environmental Quality Guidelines of April 23, 1971.

Environmental health program responsibilities and standards of the Department of Health, Education, and Welfare include those vested with the United States Public Health Service and the Facilities Engineering and Construction Agency. The U. S. Public Health Service has those programs of the Federal Food and Drug Administration, which include the National Institute of Occupational Safety and Health and the Bureau of Community Environmental Management (housing, injury control, recreational health and insect and rodent control).

Accordingly, our review of the Draft Environmental Statement for the project discerns no adverse health effects that might be of significance where our program responsibilities and standards pertain, provided that appropriate guides are followed in concert with State, County, and local environmental health laws and regulations.

We therefore have no objection to the authorization of this project insofar as our interests and responsibilities are concerned.

Very truly yours,

William F. Crawford
Environmental Impact Coordinator

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Deputy Administrator for
Water Resources

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
Department of Agriculture
Washington, D. C. 20250

Dear Mr. Grant:

This is in response to your letter of 31 January 1974 addressed to Admiral Bender concerning the watershed work plan and draft environmental statement for the Kickapoo Creek Watershed, Hood, Erath, Palo Pinto and Parker Counties, Texas.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to the project.

The opportunity to review this draft statement is appreciated.

Sincerely,

ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1600 PATTERSON, SUITE 1100
DALLAS, TEXAS 75201

March 11, 1974

OFFICE OF THE
REGIONAL ADMINISTRATOR

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
U. S. Department of Agriculture
Washington, D. C. 20250

Dear Mr. Grant:

We have reviewed the Kickapoo Creek Watershed Work Plan and the Draft Environmental Impact Statement for the Kickapoo Creek Watershed (Lipan) Project. The proposed project consists of a plan for watershed protection and flood prevention in Hood, Erath, Palo Pinto, and Parker Counties, Texas. Land treatment and conservation measures will be applied to approximately 12,260 acres of land within the watershed, and six single-purpose floodwater retarding structures will be constructed over an eight-year installation period.

In general, the information contained in the watershed plan was comprehensive and adequately covered the details of the proposed project. However, the following comments should be considered in finalizing the plan:

1. The combined operation of the six floodwater retarding structures should be such that flows would be released to downstream areas in times of drought or low-flow conditions. Such operations would help maintain and preserve the aquatic life in the creek and deepen permanent pools known to be inhabited by several species of game fish.

2. Because the community of Lipan decided not to include structure No. 2 as a multipurpose structure for water supply, assurances should be given to provide adequate facilities for downstream releases so that the yield of Bailey Lake is not depleted. Also, more information discussing the availability of uncontrolled runoff to Bailey Lake below structure No. 2

should be presented. Information of this type would be helpful in determining the possible need for releases from structure No. 2, and the flows required to avoid depleting the yield of Bailey Lake, the water supply to Lipan, Texas.

Several environmental impacts associated with the proposed watershed plan were discussed in the Draft Environmental Impact Statement. However, the following comments should be considered in strengthening the Final Environmental Impact Statement:

1. The comments discussed above as suggested for inclusion in the Watershed Work Plan should also be discussed and included in the final statement.

2. The section, Projects of Other Agencies (page 14), of the watershed plan should be included in the final statement. This information would be helpful in resolving any questions the reviewer might have concerning how the projects of other agencies within the watershed may interrelate and affect each other from an accumulative standpoint.

3. The estimated schedule of obligations for the construction of the floodwater retarding structures for the eight-year installation period listed on page 29 of the plan should be contained in the final statement. A description of the order of construction for these structures would be helpful in assessing the anticipated environmental effects that will be generated during the completion of the individual floodwater retarding structures.

4. Although the statement discussed several commendable precautions that will be followed during construction operations, the impacts from construction especially related to water quality were not fully discussed. For example, the possible effects resulting in changes in the water quality of Bailey Lake during construction of floodwater retarding structure No. 2 should be fully evaluated in the final statement.

5. On page 25 of the Environmental Impact Statement, substantiation of your contention that the "annual application of up to 280 additional tons of fertilizer will not have a significant impact on the quality of impounded water within the watershed" is needed in the final statement. To help in evaluating the project's impacts on water quality, additional information

describing the existing water quality of Kickapoo Creek, Bailey Lake, and the Brazos River should be contained in the statement. Water quality parameters such as dissolved oxygen, pH, fecal coliforms, BOD, total dissolved solids, and total suspended solids should also be listed for these waters. We believe that increased concentrations of fertilizer residues contained in watershed runoff may cause nutrient buildup to occur, which could affect the desirability of Bailey Lake for use as a domestic water supply for Lipan, Texas. Additional information analyzing the potential long-term effects of the projects on water quality of Bailey Lake, Kickapoo Creek and its tributaries, and the Brazos River should be more fully discussed in the section, Environmental Impacts.

These comments classify your Draft Environmental Impact Statement as LO-2. Specifically, we have no objection to the project. However, the statement did not contain sufficient information to evaluate the long-term impacts on water quality. The classification and the date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the attachment. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and on the adequacy of the impact statement at the draft stage, whenever possible.

We appreciate the opportunity to review the Draft Environmental Impact Statement. Please send us two (2) copies of the Final Environmental Impact Statement at the same time it is sent to the Council on Environmental Quality.

Sincerely yours,

Arthur W. Busch
Regional Administrator

Enclosure

ENVIRONMENTAL IMPACT OF THE ACTION

LO - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

EU - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

Advisory Council
On Historic Preservation
1522 K Street N.W., Suite 430
Washington D.C. 20005

April 4, 1974

Mr. Kenneth E. Grant
Administrator
Soil Conservation Service
U.S. Department of Agriculture
Washington, D.C. 20250

Dear Mr. Grant:

This is in response to your request of January 31, 1974 for comments on the environmental statement for the Kickapoo Creek Watershed (Lipan), Texas. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears procedurally adequate, however, we have the following substantive comments to make:

To insure a comprehensive review of historical, cultural, archeological, and architectural resources. the Advisory Council suggests that the environmental statement contain a copy of the comments of the Texas State Historic Preservation Officer concerning the effects of the undertaking upon these resources. The State Historic Preservation Officer for Texas is Mr. Truett Latimer, Executive Director. Texas State Historical Survey Committee, Post Office Box 12276, Capitol Station. Austin, Texas 78711.

Should you have any questions on these comments or require any additional assistance, please contact Jordan Tannenbaum (202-254-3974) of the Advisory Council staff.

Sincerely yours.

Ann Webster Smith

Ann Webster Smith
Director, Office of Compliance

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of

BRISCOE
ERNOR

OFFICE OF THE GOVERNOR
DIVISION OF PLANNING COORDINATION

JAMES M. ROSE
DIRECTOR

June 20, 1974

Mr. Kenneth E. Grant
Administrator
United States Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250

Dear Mr. Grant:

Enclosed is a copy of a letter from the Texas Archeological Research Laboratory, commenting on the proposed Kickapoo Creek Watershed Plan, which was previously reviewed by the Division of Planning Coordination and other interested State agenices, in a letter dated April 3, 1974.

Inasmuch as the Kickapoo Creek is a permanent stream and a major tributary of the Brazos River, the probability exists that some buried sites of archeologic significance will be encountered by work crews. This Division recommends that if archeologic sites are discovered in the course of construction that the Texas Historical Commission's Archeologist, Mr. Alton K. Briggs, be contacted at AC 512/475-2143, for further information concerning preservation of these cultural resources.

If we can be of further assistance, please let us know.

Sincerely,

James M. Rose

JAMES M. ROSE
Director

JMR/wsb
Enclosure
cc: Truett Latimer, Texas Historical Commission
Edward E. Thomas, United States Department of Agriculture, Soil Conservation Service, Temple, Texas

TEXAS ARCHEOLOGICAL RESEARCH LABORATORY
THE UNIVERSITY OF TEXAS AT AUSTIN
BALCONES RESEARCH CENTER
ROUTE 4 BOX 189, AUSTIN, TEXAS 78757

IPATING AGENCIES:
RTMENT OF ANTHROPOLOGY
S MEMORIAL MUSEUM
S ARCHEOLOGICAL SALVAGE PROJECT

April 17, 1974

Mr. James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P. O. Box 12428
Capitol Station
Austin, Texas 78711

Dear Mr. Rose:

Our apologies for the delay in answering your inquiry on the Kickapoo Creek Watershed Plan. Though the deadline is past, we hope you find our comments to be useful.

Our files have no record of sites which would be affected by the project. Apparently the only systematic survey of the area is that of Southern Methodist University mentioned in the draft report. While we have no basis for accurately accessing the archeological resources, it should be noted that Kickapoo Creek is a permanent stream and a major tributary of the Brazos River. It therefore seems probable that some sites will be encountered by work crews--particularly buried sites, which are likely to be overlooked by surface explorations.

Because information on sites in the watershed area is scarce, their preservation is doubly important. In view of this we would like to recommend that additional care be taken as work progresses to protect these archeological resources.

Sincerely yours,

Carolyn Spock

Carolyn Spock
Research Associate

cc: Ross Shipman

LPH BRISCOE
GOVERNOR

OFFICE OF THE GOVERNOR
DIVISION OF PLANNING COORDINATION

JAMES M. RO

April 3, 1974

Mr. Kenneth E. Grant
Administrator
U. S. Department of Agriculture
Soil Conservation Service
Washington, D. C. 20250

Dear Mr. Grant:

The work plan and the draft environmental statement for the Kickapoo Creek Watershed (Lipan), Texas, have been reviewed by the Governor's Division of Planning Coordination and by other interested State agencies.

Review participants generally agreed that the draft environmental statement was in reasonable conformity with the provisions of the National Environmental Policy Act of 1969. However, the Texas Water Rights Commission recommended that updated cost data be included, in view of the continually increasing construction costs. In addition the Texas Water Rights Commission noted that recognition should be given to major water rights impacts of the proposed projects.

Enclosed for your consideration are the comments made by the review participants.

If we can be of further assistance, please let us know.

Sincerely,

JAMES M. ROSE
Director

JMR/wsb
Enclosures
cc: Mr. Charles R. Barden, Texas Air Control Board
Mr. Clayton Garrison, Texas Parks and Wildlife Department
Mr. Harry Burleigh, Texas Water Development Board
Mr. James H. Harwell, Texas Industrial Commission
Mr. Hugh C. Yantis, Jr., Texas Water Quality Board
Mr. Harvey Davis, Texas State Soil and Water Conservation Board
Mr. A. E. Richardson, Texas Water Rights Commission
Mr. B. L. DeBerry, Texas Highway Department

TEXAS 78711
State Office Building

TEXAS AIR CONTROL BOARD

PHONE 512/451-5711
8520 SHOAL CREEK BOULEVARD
AUSTIN, TEXAS - 78758

CHARLES R. BARDEN, P. E.
EXECUTIVE DIRECTOR

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E.W. ROBINSON, [illegible]
CHARLES R. JA[illegible]
JAMES D. ABRAMS, [illegible]
FRED HARTM[illegible]
WILLIE L. ULICH, PH.D., [illegible]
JOE C. BRIDGEFARMER, [illegible]

March 7, 1974

Mr. Wayne N. Brown, Chief
State Planning and Development
Office of the Governor
Division of Planning Coordination
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Brown:

In regard to the Draft Environmental Impact Statement and Work Plan for the Kickapoo Creek Watershed (Lipan), Texas, since this is solely a water oriented project we have no comments to offer. The impact on air quality of the proposed project is essentially non-existent.

Nevertheless, we appreciate being informed on environmentally significant projects throughout the State. Thank you for the review opportunity.

Sincerely yours,

Bill Stewart, P.E.
Director
Agency Operations

TEXAS
PARKS AND WILDLIFE DEPARTMENT

MISSIONERS

R. STONE
airman, Wells

L. FULTON
ce-Chairman, Lubbock

CE JOHNSON
stin

CLAYTON T. GARRISON
EXECUTIVE DIRECTOR

JOHN H. REAGAN BUILDING
AUSTIN, TEXAS 78701

COMMISSIONERS

BOB BURLESON
Temple

JOHN M. GREEN
Beaumont

LOUIS H. STUMBERG
San Antonio

March 12, 1974

Mr. Wayne N. Brown, Chief
State Planning and Development
Office of the Governor
Division of Planning Coordination
P.O. Box 12428, Capitol Station
Austin, Texas 78711

Attention: Mr. Brice Barnes

Dear Mr. Brown:

The Texas Parks ard Wildlife Department has reviewed the Draft Environmental Statement for the Kickapoo Creek Watershed, Lipan, Texas, and we have no additional comments.

Sincerely,

CLAYTON T. GARRISON
Executive Director

CTG:WJS:ac

TEXAS WATER DEVELOPMENT BOARD

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HN H. McCOY, CHAIRMAN
NEW BOSTON
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HARRY P. BURLESON
EXECUTIVE DIRECTOR

P.O. BOX 13087
CAPITOL STATION
AUSTIN, TEXAS 78711

AREA CODE 512
475-2201

301 WEST 2ND STREET

March 15, 1974

IN REPLY REFER TO

TWDBP-O

Mr. Wayne N. Brown, Chief
State Planning and Development
Division of Planning Coordination
Office of the Governor
P.O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Brown:

Please refer to your memorandum dated February 26 transmitting for review and comments the Soil Conservation Service's Draft Environmental Impact Statement Kickapoo Creek Watershed (Lipan), Erath, Hood, Palo Pinto, and Parker Counties, Texas.

Our staff-level review finds general agreement with conclusions reached in the report, and we are of the opinion that it fulfills the intent of Public Law 91-190 Section 102 (C).

The review carried out by this agency made no attempt to verify the hydrology nor economic values shown in the report. Land treatment and flood retarding measures which are discussed have been practiced in Texas for many years, and have proved to be effective. Our review, therefore, is concerned more with the objectives of the project than with analysis of data.

It is shown in the Environmental Statement that implementation of the plan of development will result in fulfilling many needs for man's economic and environmental betterment. Such benefits include: the ability to produce more food for himself and for wildlife; providing more drinking water; the controlling of land erosion with its attendant economic and environmental losses; and the elimination of flooding which interrupts travel, farm

operations, and causes expensive repair work. These long-term benefits appear to offset relatively minor adverse effects such as: temporary increases in erosion during the construction period, and dust generated by construction equipment; the loss of some wildlife browse areas when 770 acres of brushy land are cleared for agricultural purposes; and the shift in wildlife habitat resulting from the inundation of some land.

Several alternatives to the proposed plan were discussed. In our opinion, the option which has been selected for implementation is by far the most practical approach.

We appreciate the opportunity to make this review.

Sincerely,

for Harry P. Burleigh

TEXAS WATER DEVELOPMENT BOARD

MEMBERS
McCOY CHAIRMAN
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HARRY P. BURLESON
EXECUTIVE DIRECTOR

AREA CODE 512
475-2201

301 WEST 2ND STREET

P.O. BOX 13087
CAPITOL STATION
AUSTIN, TEXAS 78711

March 15, 1974

IN REPLY REFER TO
TWDBP-O

Mr. Wayne N. Brown, Chief
State Planning and Development
Division of Planning Coordination
Office of the Governor
P.O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Brown:

Please refer to your memorandum transmitting for review and comment the Watershed Work Plan, Kickapoo Creek Watershed (Lipan), Erath, Hood, Palo Pinto, and Parker Counties, Texas.

The report shows that Kickapoo Creek Watershed comprises an area of 81.5 square miles within the four counties of Erath, Hood, Palo Pinto, and Parker. Frequent flooding of the 2,960 acre flood plain causes estimated damages averaging $53,200 annually. Land treatment measures and flood retarding structures proposed in the work plan are projected to reduce such losses by 70 percent, or $37,200.

Work proposed under the plan of development includes: construction of 6 flood retarding structures; land treatment to be established and maintained on 12,260 acres of crop, pasture and range land; and maintaining land treatment measures already established, which includes about 45 percent of the total treatment needed in the Kickapoo Creek basin. Construction will be extended over an 8 year period of time.

The report shows that under existing conditions more than half of the flood-plain lands are utilized to far less than their potential. Flooding and deposition of sediments destroy crops or reduce yields. Indirect losses result from the interruption of

travel patterns and the disruption of farm operations. Both land treatment measures and the flood-retarding structures are designed to alleviate losses from flooding. Major economic benefits are expected from land treatment measures which will improve pastures and range land conditions through removal of brush and the re-seeding of presently eroded areas.

Certain social, as well as economic, benefits will accrue to the area as a result of implementing the work plan. Prevention of flood damages, which require expensive repairs, will enable the landowner to spend more time and money enhancing the appearance of his property.

We believe that to an indeterminate degree the normal rainfall runoff that will reach Kickapoo Creek after the watershed plan has been fully implemented will be less than is being experienced currently. However, the influence on the Brazos River Basin downstream from the confluence of Kickapoo Creek will be extremely small - if indeed measurable. Some reduction in streamflows is acknowledged in the report.

No objections to the work plan are expressed by the Water Development Board staff. We do recommend that reasonable precautions be taken in construction operations to avoid the creation of soil erosion processes.

The opportunity to review this work plan for Kickapoo Creek Watershed is appreciated.

Sincerely,

for Harry P. Burleigh

TEXAS STATE SOIL AND WATER CONSERVATION BOARD
1018 First National Building
Temple, Texas 76501
AREA CODE 817, 773-2250
March 1 , 1974

Brigadier General James M. Rose
Director, Executive Department
Division of Planning Coordination
Box 12428 , Capitol Station
Austin, Texas 78711

Re: Kickapoo Creek Watershed Project

Dear General Rose:

Your memorandum of February 26, 1974, invites our review and comment on the Kickapoo Creek Watershed Project near Liban, Texas.

Our relationships with the small watershed program, the local sponsors of this project, and the Soil Conservation Service have afforded us many opportunities to participate in the development of the documents that have been forwarded to us. However, we do wish to point out some facts relevant to the project:

1. Projects developed under Public Law 83-566 must have strong local support. Acquisition of all land rights and operation and maintenance of the completed project are totally local responsibilities. The Commissioners Courts of Erath, Hood, and Parker Counties have agreed to handle the financial part of these responsibilities. The Hood-Parker, Bosque, and Palo Pinto Soil and Water Conservation Districts will be responsible for land treatment work and part of the operation and maintenance work. They will also assist with land rights problems. It is unlikely that any project requiring this level of local effort would ever get started if it did not have strong appeal to the local people.

2. When local sponsors submit a watershed application, it is forwarded to this agency. Those that are feasible for project action receive an on-the-ground inspection, informal public hearing, and, finally, a planning priority from the members of the State Soil and Water Conservation Board before being passed on to the Soil Conservation Service for planning. The State Board conducted their inspection tour and informal hearing on Kickapoo Creek on May 3, 1973 and granted a planning priority on May 21, 1973. When considering a project for plan development, the Board concerns itself with the level of need and the degree of local support. A small amount of local opposition can outweigh a strong need in the Board's deliberations. Again, the desires of the local people come first.

3. Work plan development on Kickapoo Creek has been in process for almost six years. During this time, there have been numerous meetings and other opportunities where any interested individual or agency could present information relative to project development. Furthermore, the local sponsors circulated a "review draft" of the work plan on February 12, 1973, to most, if not all, of the agencies that are again being given an opportunity to review and comment. In our opinion, the Kickapoo Creek project has been fully coordinated.

4. The local sponsors and the federal agency providing construction funds and engineering for Kickapoo Creek are well experienced with the small watershed program. The six sponsors of this project have been associated with thirteen other watershed projects. Three of these are now completely built and three others are under construction. The Soil Conservation Service has completed nearly 1600 floodwater retarding structures in Texas comparable to those planned for Kickapoo Creek. There have been remarkably few problems associated with these structures. The small watershed project has proven to be a sound one and is administered by experienced sponsors and agencies.

In summary, we believe that the Kickapoo Creek Watershed Work Plan and Environmental Statement are worthy of endorsement by the State of Texas. We believe that the Kickapoo Creek project is sound in all respects and therefore concur with the local people's committment to this project.

Thank you for the opportunity to contribute our views. We appreciate your efforts to further the implementation of this plan.

Sincerely yours,

Harvey Davis
Executive Director

HD:ej

March 7, 1974

Mr. Wayne Brown, Chief
State Planning and Development
Office of the Governor
Division of Planning Coordination
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Wayne,

At the request of Mr. James Harwell, Executive Director of the Industrial Commission, I have reviewed the following environmental statements:

1. Draft Environmental Statement:
   Grayson County
   U.S. Highway 75: From F.M. 131 in Sherman to Red River and Spur 503: From proposed U.S. Highway 75-A South of Denison.

2. Draft Environmental Statement and Work Plan for the Kickapoo Creek Watershed (LIPAN), Texas.

This review indicates that the Industrial Commission would have no negative comments to make on either of these projects.

If I may be of further service on either of these projects please do not hesitate to contact me.

Sincerely,

Frank J. Call, Director
Research and Planning

FJC/jet

HUGH C. YANTIS, JR.
CHAIRMAN

J.K. LEWIS
VICE-CHAIRMAN

[illegible] BURLEIGH

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J. E. PLANK, MD

HUGH C. YANTIS, JR.
EXECUTIVE DIRECTOR

PH. [illegible]
AC 51

TEXAS WATER QUALITY BOARD

1700 NORTH CONGRESS AVE. 78701
P.O. BOX 13246 CAPITOL STATION 78711
AUSTIN, TEXAS

March 18, 1974

RE: Draft Environmental Statement
Kickapoo Creek Watershed (Lipan)
in Erath, Hood, Palo Pinto and
Parker Counties

Mr. James M. Rose, Director
Division of Planning Coordination
Office of the Governor
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Dear Mr. Rose:

The staff of the Texas Water Quality Board has completed a review of the draft environmental statement for Kickapoo Creek Watershed Work Plan referenced above and have concluded that the projects proposed would not pose lasting environmental problems. It has been noted that the area will be protected from soil erosion and water and air pollution both during and after construction. Also, assurances have been given that adequate sanitary facilities meeting State health standards will be provided at reservoirs prior to any recreational use.

We appreciate the opportunity to review this proposed project. If we can be of further assistance to you, please let us know.

Very truly yours,

Emory G. Long

Emory G. Long, Director
Administrative Operations Division

TEXAS WATER RIGHTS COMMISSION

SAM HOUSTON STATE OFFICE BUILDING

ISSIONERS

ARTER CHAIRMAN
153

DENT
451

B HARDEMAN
325

March 18 1974

A. F. RICHARDSON
EXECUTIVE DIRECTOR
475-2452
AUDREY STRANDTMAN
SECRETARY
475-4514

Mr. James M. Rose, Director
Governor's Division of Planning
Coordination
P. O. Box 12428, Capitol Station
Austin, Texas 78711

Attention: Mr. Wayne N. Brown, Chief
State Planning and Development

Re: U.S. Department of Agriculture, Soil Conservation Service (USDI SCS) Related Documents:
A. "Draft Watershed Work Plan, Kickapoo Creek Watershed (Lipan), -- Erath, Hood, Palo Pinto, and Parker Counties." July 1973.
B. "Draft Environmental Statement, USDA-SCS-ES-WS-(ADM)-74-17(D)," January 1974.

Dear Mr. Rose:

In reply to the requests contained in your Memorandum of February 26, 1974, and in letter of February 4, 1974 from the Administrator, USDI, SCS, Washington, D.C., the staff of the Texas Water Rights Commission has reviewed the two referenced documents pertaining to the estimated $1,373,420 watershed protection and flood prevention project involving the construction of six single-purpose floodwater retarding structures, and the application of land conservation and treatment measures on 12,260 acres of land over a period of eight years.

This review was made pursuant to the Commissions' responsibilities as a member agency of the Interagency Council on Natural Resources and the Environment (ICNRE), assisting your office in performing the State Clearinghouse Review functions as required by the Office of Management and Budget (OMB) Circular A-95 (Revised), November 13, 1973.

The staff notes: (1)The advanced stage of project development; (2)The completion of numerous public meetings with sponsoring local organizations and involved landowners -- the last held on July 24, 1973, in Granbury, Texas; (3)The approval given by the Texas State Soil and Water Conservation District Board; (4)The Commission submitted detailed comments to the Governor's Division of Planning Coordination by letter of March 13, 1973, on both the Watershed Work Plan (WWP), and the Preliminary Draft Environmental Statement (PDES); and (5)By letter of May 2, 1973, the Environmental Sciences Analyst, Texas Water Rights Commission, transmitted, as requested, to Mr. W. W. Snyder USDA SCS Temple, Texas, a copy of the March 13, 1973, correspondence and staff review comments referred to above.

Constrained by the above-mentioned prior actions, the staff believes that the referenced documents would be enhanced by:

1. A realistic updating of the cost data contained in Table 1, page 44, of the WWP, and in the tabulation on page 14 of the DES. The Engineering News-Record (ENR) of March 14, 1974, indicates that as of March 7, 1974, the ENR Construction Cost Index Value was 1953.5, representing a 4.9 percent increase from last year. Staff analysis indicates that the trend in construction cost increase will continue, and therefore, mention should be made of the probable overall construction cost differential over the eight-year period during which the project will be in progress.

2. Specific clarification of the statement contained in the third unnumbered paragraph on page 37 of the DES, presumably relating to the probable overall effect on watershed runoff resulting from construction of the 19 floodwater retarding structures of the four watershed projects -- one of which is the Kickapoo Creek Watershed Project, consisting of six structures. In other words, it is not clear whether the following statement, in the above

mentioned third paragraph, applies to the Kickapoo Creek six-structure, the 11-structure, or the 19-structure project:

> "It is estimated that the cumulative decrease in average annual runoff to Lake Granbury that originates within the intervening drainage area will initially be about 0.13 percent." (See DES, page 37.)

If, in fact, the entire 19-structure project results in only a 0.19 percent reduction in average annual runoff, it is believed that the sediment retention benefits appear excessive. It does not appear practical that such a low runoff would correspond to a large sediment load.

3. Proper modification of Table 6, on page 50 of the WWP, to correspond with the footnoted changes in the Table at Appendix A of the DES. Specifically, clarification should be made of the final discount rate which will be adopted.

The staff finds that the referenced DES appears to be in reasonable accord with the provisions of Section 102(2)(C) of Public Law 91-190. However, recognition should be given in the documents to major water rights impacts of the proposed project. Specifically, mention should be made that the detailed project plans and construction will be executed with due regard to the protection of existing water rights, and, further, that water rights problems will be resolved with the Texas Water Rights Commission.

The above review comments are furnished with constructive intent for consideration by the project planners concerned.

If you have questions on the foregoing comments, please contact Dr. Alfred J. D'Arezzo, Environmental Sciences Analyst, telephone number 475-2678.

Sincerely yours,

A. E. Richardson

AER-AJD:ll

COMMISSION
EAGAN HOUSTON, CHAIRMAN
EWITT C. GREER
HARLES E. SIMONS

TEXAS HIGHWAY DEPARTMENT
11TH AND BRAZOS
AUSTIN TEXAS 78701

STATE HIGHWAY ENGINEER
B. L. DEBERRY

March 22, 1974

IN REPLY REFER TO
FILE NO. D8-P 454

U. S. Department of Agriculture
Draft Environmental Statement
Erath, Hood, Palo Pinto and Parker Counties

Kickapoo Creek Watershed (Lipan)

Mr. Wayne N. Brown, Chief
State Planning and Development
Division of Planning Coordination
Office of the Governor
P.O. Box, 12428, Capitol Station
Austin, Texas 78711

Dear Sir:

Reference is made to your letter dated February 26, 1974, submitting the draft environmental statement on the subject project for comments.

The draft environmental statement and work plan from the U.S. Department of Agriculture covering the Kickapoo Creek Watershed, Lipan, Texas, has been reviewed.

The proposed project apparently will not have any significant effect on the State highway system or any highway projects under development.

Sincerely yours

B. L. DeBerry
State Highway Engineer

By: R L Lewis

R. L. Lewis, Chief Engineer
of Highway Design

cc: Federal Highway Administration

Central Texas Council of Governments

P. O. Drawer COG Arlington, Texas 76011

April 10, 1974

Mr. Edward E. Thomas, State Conservationist
Soil Conservation Service
U. S. Department of Agriculture
P. O. Box 648
Temple, Texas 76501

RE: 4-03-03020, Received March 7, 1974
Kickapoo Creek Watershed Project
Environmental Assessment Statement

Dear Mr. Thomas:

Your application for a grant in the amount of $854,590 from the Soil Conservation Service, Department of Agriculture for the above entitled project has been reviewed by the North Central Texas Council of Governments. This review included the notification of potentially affected local governments, including the counties of Palo Pinto, Erath, Parker and Hood and the city of Lipan. These local governments were invited to comment on the local impact of the proposal, and a reply received from NCTCOG's notification is attached to this letter.

In addition, the project was reviewed for appropriate area-wide concerns. This review process included consideration by appropriate NCTCOG planning staff, by the Environmental Review Committee on April 3, by the Government Applications Review Committee on April 10 and by the NCTCOG Executive Board on April 18. On the basis of that review process, the Board adopted the following areawide position on this proposal:

> "The NCTCOG Review Process has disclosed no conflict with the review criteria of areawide comprehensive planning as outlined in OMB Circular A-95 (Revised). Favorable consideration of the application by the funding agency is recommended."

We sincerely thank you and your staff for your kind cooperation in this matter, and if we can be of further service or assistance, please feel free to call upon us.

Sincerely,

William J. Pitstick

William J. Pitstick
Executive Director

dlh
Enclosure
cc: See attached page

cc: The Honorable Bill Ward, County Judge, Parker County, Texas
Kenneth E. Grant, Administrator, Soil Conservation Service